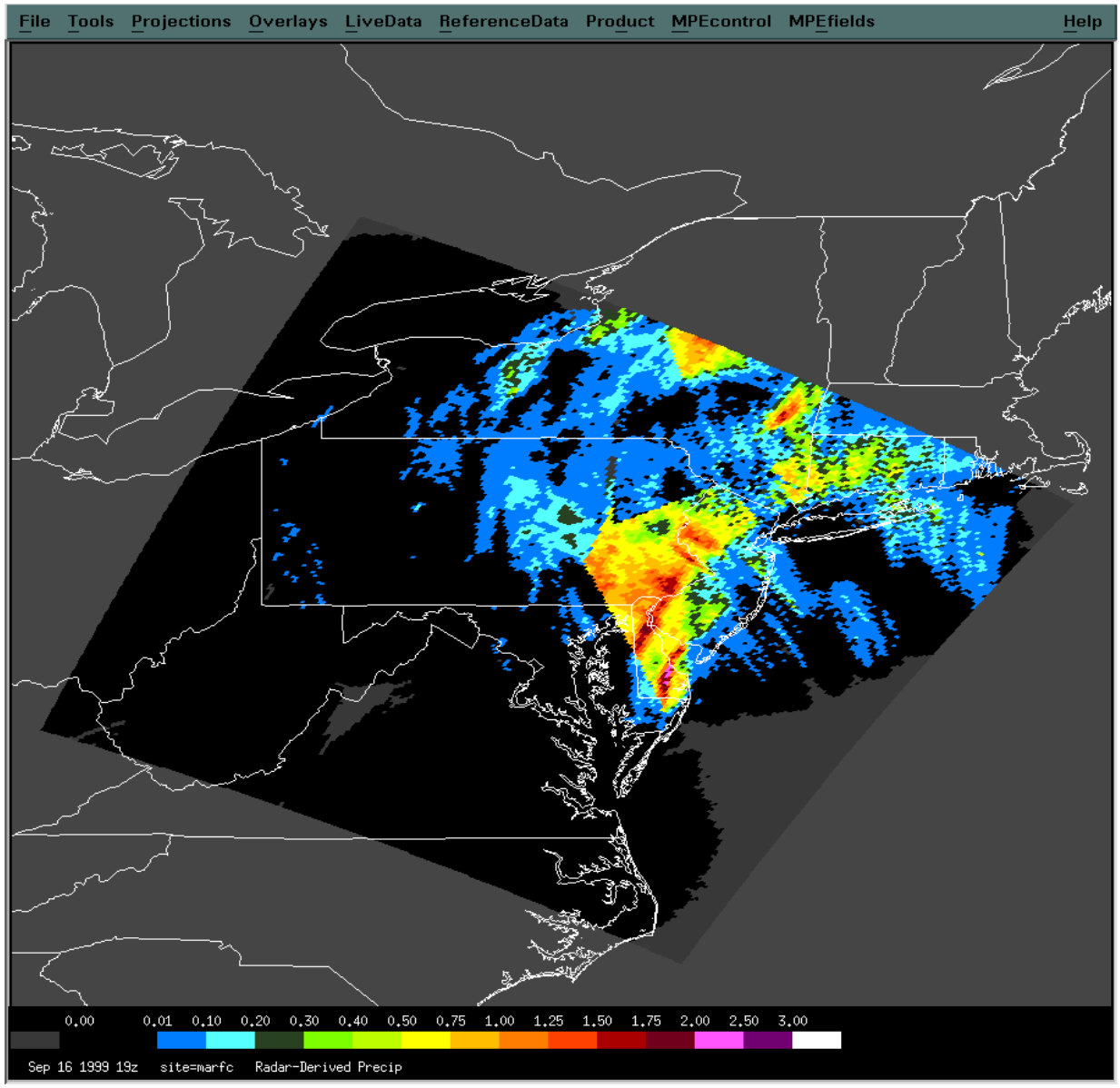
Hydroview/MPE
User's Guide

August 11, 2003
Build OB3
NWS Office of Hydrologic Development



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1.0 Introduction

The **Hydroview_MPE** application is the result of an effort to consolidate the Hydroview and Multi-sensor Precipitation Estimator (MPE) programs into a single, versatile utility that can be used at both RFCs and WFOs. Hydroview's focus is primarily on the display of point hydrometeorological data such as river and stream gage readings, precipitation amounts, and similar environmental information that is typically observed and forecast for a specific location. It assists in the preparation of hydrologic forecasts by allowing the user to display and edit this data as well as station reference information such as river action and flood stages, historic river crests, emergency contacts, river rating curves, and dam catalogs.

MPE's focus is on areal estimations of rainfall amounts based on both remotely sensed data (radar, satellite) and actual observations (rain gages). It creates hourly, gridded, multi-sensor precipitation estimates on a 4-km Hydrologic Rainfall Analysis Project (HRAP) grid. The primary inputs to MPE are the gridded Digital Precipitation Array (DPA) products, which provide radar estimates on a 4-km grid, and precipitation gage data. The main steps involved in creating the multi-sensor estimate include determining a mean field bias adjustment, creating a multi-radar mosaic, and merging the mosaic with precipitation gage observations. One of the important features of Hydroview/MPE is the ability to edit the gridded data fields as well as the point gage observations. In the process of performing these operations, multiple types of precipitation grids are generated, with one of these designated as the best grid. At RFCs, this resulting grid is then used to produce MAPX time series for input into NWSRFS.

The combination of these two programs provides the forecaster with the ability to interactively monitor multi-sensor rainfall estimates, detailed point data, and flash flood guidance.

An attempt was made to preserve as much of the original functionality of Hydroview and MPE as possible. Inevitably, a few new features have been added to make the marriage of these two programs more seamless and useful. These are described in detail below. Note that it is assumed that the reader of this document is already somewhat familiar with the behavior of the Hydroview and MPE programs. Even so, all features, even those that were not modified will be covered in some detail.

In this document, the new functionality added to Hydroview_MPE will be described first in Section 2. Following this, the overall appearance and operation of the Hydroview_MPE application and all of its tools will be the subject of Section 3. If you are already familiar with Hydroview and MPE, then Section 2 will probably be of the most interest to you. However, if you are new to the world of Hydroview and MPE, then both Sections 2 and 3 will provide you with an in depth insight into how the Hydroview_Mpe application operates. Finally, in section 4 the mouse and hot key controls are discussed.

2.0 New Features in Hydroview/MPE

2.1 Menu Reorganization

Several new options have been introduced to the Hydroview/MPE menus. Also, a few of the existing Hydroview/MPE menu options have been reorganized to make them easier to understand and more coherent.

Also, each Hydroview/MPE menu has been setup so that it can be torn off. This feature allows heavily used Hydroview/MPE features to be accessed more quickly by reducing the number of mouse clicks necessary to reach them.

2.1.1 Overlays Menu

The Overlays menu in Hydroview/MPE has been modified. The All Streams/Lakes, Major Streams/Lakes and No Streams/Lakesoptions have been grouped together in a submenu under the Streams/Lakes menu item. The three options on this submenu are All Streams/Lakes, Major Streams/Lakes, and No Streams/Lakes**.** These options exhibit a radio behavior allowing only one to be selected at a time.

A submenu has been created under the Highways/Roads overlay item. This submenu has the Highways/Roads, Highways, and None options. This provides the user with ability to view the binary file versions of the IHFS Highway/Road overlays in the GeoLine table. Only one of these submenu options may be selected at a time.

The Grids item on the Overlays menu has been replaced by HRAP. The option to display the HRAP grid overlay was formerly located as a submenu under the Grids item.

A new addition to the overlay menu is the Set Font item. This leads to a submenu which allows the selection of one of five font styles: Very Small, Small, Normal, Large, and Very Large. The selection of a new font causes the text displayed on the Hydroview/MPE viewing area to be automatically updated

2.1.2 MPEfields Menu

The MPEfields menu has a new item named “Set Colors ...”. This option allows the precipitation levels and the corresponding color assignments to be modified for each of the MPE precipitation and reference fields. The modified levels and colors are stored in the IHFS database based on the identifier of the user who created them. This allows individual users to set up MPE field color schemes according to their preferences and special circumstances (such as color blindness). It also provides a way to extend the scale of precipitation levels during extreme precipitation events when the default color scheme may not be adequate to represent the higher rainfall amounts.

2.1.3 Tools Menu

The Areal Zoom option has been added to the Tools drop down menu. It is used with the rectangle zoom feature which is introduced in section 2.2.5. The hot key Ctrl+Z has been added to the Areal Zoom to allow quicker zooming control.

2.2 Show Gage Identifiers / Show Gage Values

The MPE gage values and identifiers now take advantage of a special drawing style which ensures that a gage's value and identifier are always visible no matter what the color of the background is. This helps distinguish a gage's id and value when it happens to be plotted over a background which has a similar color.

2.3 Basin Boundaries, Streams, Rivers, Lakes

Further work has been done to provide more flexibility in selecting the sources of Hydroview/MPE overlays. As before, the hmap_mpe_overlay_configuration file specifies where overlays are read from. The Basins, Streams, Rivers, and Lakes overlays, which were read from the IHFS database in OB2 have now been set up so that they may also be read from binary files. This was done to minimize the initial delay observed the first time these overlays were read from the database. The binary overlay files are created by the Hydrobase application using the IHFS Geoarea and Geoline database tables. This means the overlay should be the same whether Hydroview/MPE is set up to read it directly from the IHFS database or from the corresponding binary file.

2.4 Draw Polygons

In OB3, several modifications have been made to the draw polygon feature. These include a new set of buttons on the Edit Precipitation GUI which provide additional control over the precipitation data contained within a drawn polygon. These buttons allow this data to be scaled by a set multiple, raised so that all values are at or above a set precipitation threshold, or lowered so that all of the values are at or below a set threshold value. The option to fill a polygon with one precipitation value has been carried over from OB2 and previous builds.

There is now no limit on the number of polygons that may be drawn on the Hydroview/MPE viewing area. When drawing a polygon, the first point must be drawn within the site's MPE area. If it is not, then a warning message box is displayed. Subsequent points may be drawn inside or outside of the box defining the MPE area. Points plotted outside of the MPE area will automatically be snapped back to the MPE area boundary. This will allow precipitation on the edge of the MPE area to be edited without the annoying MPE area bounds warning message being displayed.

The performance when drawing polygon points has been significantly improved. This will make it easier to draw polygons, especially on HP-UX platforms where the delay was the most noticeable.

2.5 Zooming/Panning/Recentering

In Builds 5.2.2, OB1, and OB2, Hydroview_MPE provided a large amount of flexibility when it came to manipulating the orientation of the map displayed within the viewer. The user has the option to zoom in and out of the map; to pan north, east, south, and west; and to recenter the display on any selectable portion of the map. Build OB3 Hydroview_MPE provides all of this and additionally the ability to draw a zoom rectangle.

A zoom rectangle is drawn by holding down the left mouse button and dragging the mouse pointer in the Hydroview/MPE viewing area. An elastic rectangle will be drawn with its size depending

on the current position of the mouse pointer in relative to where the rectangle was started. When the left mouse button is released, the rectangle remains drawn on the screen. By pressing the Ctrl+Z hotkey or selecting the AAreal Zoom option under the Tools menu, the application will zoom into the rectangle. Subsequent presses of Ctrl+Z or selections of Areal Zoom will zoom the map in to and out of the rectangle.

The rectangle zoom box is a feature that was present in the original MPE. It allows a forecaster editing precipitation data to quickly zoom into areas of interest and then zoom out to the original map orientation.

2.6 Map Projections

In addition to the Flat Lat/Lon Map projection offered in builds 5.2.2, OB1, and OB2, OB3 Hydroview/MPE offers a Polar Stereographic and a HRAP projection.

The HRAP projection is a special case of the Polar Stereographic projection in which the reference longitude is set as 105 degrees west. The result of this is that a site=s MPE forecast area will be displayed as a perfect rectangle without any of the distortions or rotations which may be seen on the Flat Lat/Lon and Polar Stereographic projections. The HRAP projection option uses a best fit algorithm to optimize the view of a site=s MPE area. The resulting Hydroview/MPE display is very much like that of the original MPE. This projection is also special in that performing a Ctrl+Z or selecting Areal Zoom from the Tools menu after any combination of panning and zooming will reset the Hydroview/MPE display to the initial HRAP projection view. This is useful when consistent screen captures of MPE precipitation fields are required.

2.7 New Name Column in Selected GUIs

A “Name” column has been added to the following GUIs: Point Data Tabular Display, Point Precipitation Accumulations, Alert and Alarm Data Values, Questionable and Bad Data, Data Trash Can, and Station Reporting Status. This column was added to aid forecasters in recognizing what station a location identifier represents.

2.8 Display 7X7 Modifications

Modifications have been made to the display 7x7 functionality. The slider bar used for adjusting gage values has been placed on the bottom of the Display 7X7 Gage Editing Utility GUI instead of having it as a separate popup window. An undo button has been added to return a gage value to its unedited state. It is now not necessary to close and reopen the Display 7X7 GUI when editing successive gage values. The GUI may be left open, and it will automatically update when a new gage is selected on the Hydroview/MPE map. The goal in all of these modifications was to minimize the number of mouse clicks the user has to perform when editing gage values.

3.0 The Hydroview_MPE Graphical User Interface

This section of the document describes in greater detail all of the various utilities available through the menubar displayed across the top of the Hydroview_MPE main window. After t this it describes the mouse-controls in greater in detail.

3.1 The Main Window

The Main window is the first window which appears when the application is opened, and it is the primary controlling window for the Hydroview_MPE process. This simple window consists of a main menubar across the top and a large display area. The user has extensive control over what is displayed in the display area. **By default, state boundaries, rivers, reservoirs, and Hydroview point data are displayed in the display area when the application is first started.** The user can set which overlays are initially shown in the application by selecting the various overlay options under the Overlays menu. Also, the user has the ability to modify the initial overlays displayed by editing the overlay configuration file. This is described in more detail in the accompanying ***Hydroview_MPE Implementation Document***. Tokens also exist to control the initial point control data display which determines the appearance of the Hydroview point data. Note that by default, MPE data are not shown when Hydroview_MPE is first launched.

3.2 The Main Menubar

The menubar which spans across the top portion of the Hydroview_MPE viewer shows the following menu headings, listed from left to right: **File**, **Tools**, **Projections**, **Overlays**, **LiveData**, **ReferenceData**, **Product**, **MPEcontrol**, and **MPEfields**. Utilities are logically grouped by function under these menu headings. Each of these drop down menus is described in detail below.

3.2.1 File Menu Options

The File sub-menu has the following available options: **Save as Gif**, **Print Image**, **Print Reverse Image**, **Close**.

3.2.1.1 Save as Gif - Displays a popup window which allows the user to screen capture the current Hydroview_MPE display and save it as a gif- formatted file. It is up to the user to make sure that nothing is obscuring the Hmap/MPE viewing area before pressing "Ok" on this dialog box. Any windows that obscure or overlap the Hydroview_MPE viewing area will be captured and become part of the resulting GIF. The user must make certain that the filename chosen to save the GIF image has the extension "*.gif". If it does not, an error will result. **Note that this option is different than the "Save Hour's Data" option on the MPEcontrol menu. The "Save Hour's Data" option does not allow the user to specify a name for the GIF file. Also, a gif image is only generated by it when the "mpe_save_gif" token is set to "save"**.

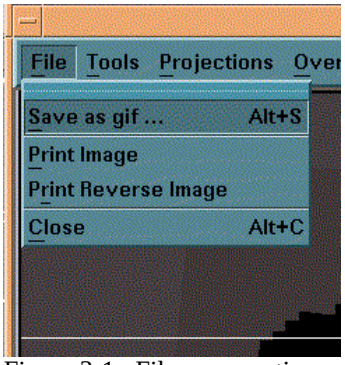

Figure 3-1. File menu options

3.2.1.2 Print Image - This option will perform a screen capture of the current Hydroview_MPE display and output the resulting image to the printer. Currently, color printing is only supported for the HP platform. In order to print an image to a specific printer, the user must take care to properly set the following tokens:

whfs_printcommand_HP - If running on HP-UX, this token must be set to contain the full print command including any non-default user-desired destinations. For example, to print the image out to lp3, the whfs_printcommand_HP token should be set to something like **"lp -dlp3"**. This token defaults to value **"lp"**.

whfs_printcommand_LX - If running on Linux, this token must be set to contain the full print command including any non-default user desired destinations. For example, to print the image out to lp2, the whfs_printcommand_LX token should be set to something like **"lp -dlp2"**. This token defaults to value **"lp"**.

Color printing is currently supported only on the HP. If a color image is desired, then set **whfs_print_color** token to **YES**. Make certain that the **whfs_printcommand_HP** token is set to a valid color printer. Otherwise, the quality of the printed results may be degraded.

3.2.1.3 Print Reverse Image - This option will perform a screen capture of the current Hydroview_MPE display and output the resulting image in reverse video to the printer. Currently, color printing is only supported for the HP platform. In order to print an image to a specific printer, the user must take care to properly set the tokens outlined in the section above entitled **Print Image**.

3.2.1.4 Close - This option will close the application.

3.2.2 Tools Menu Options

The choices of Tools sub-menu are **Areal Zoom, Point Zoom**, **Pan**, **Recenter**, and **Tool Bar**.

3.2.2.1 Areal Zoom - Areal Zoom and its associated hot key combination <Ctrl+Z> allow the Hydroview/MPE display to be zoomed into and out of an area bounded by a zoom rectangle.

They also allow the Hydroview/MPE map to be returned to its prior state after a zoom, pan or recenter operation.

The zoom rectangle is drawn by holding down the left mouse button and dragging the mouse. Once the rectangle is the desired size the left mouse button may be released. By selecting Areal Zoom or Ctrl+Z the Hydroview_MPE map display will zoom into the area inside the rectangle. Selecting Areal Zoom or Ctrl+Z again will zoom the display out to its inital state.

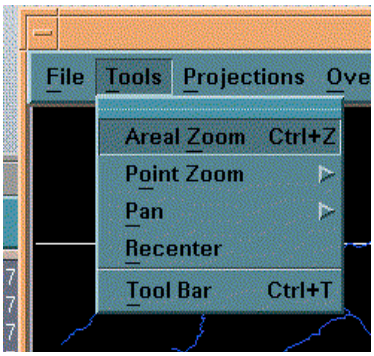

Figure 3-2. Tools menu options

3.2.2.2 Point Zoom - Selecting Point Zoom brings up a small menu with the options "In" and "Out" on it. "In" zooms into the map. "Out" zooms out of the map.

3.2.2.3 Pan - Selecting this option brings up a small menu with the options "Up", "Down", "Right", and "Left" on it. These options allow the user to easily navigate around the map.

3.2.2.4 Recenter - Selecting this option changes the mouse pointer to a leftward pointing hand. A single left mouse button click on the Hydroview_MPE display while in this mode will recenter the map display around that point on the map.

3.2.2.5 Tool Bar - This option is a toggle button which enables or disables the display of the application's toolbar. This toolbar by default is "off". When it is enabled through this menu option, it is displayed just below the main menubar. This toolbar contains the following items from left to right: the pan up button, the pan down button, the pan left button, the pan right button, the recenter button, the zoom in button, the zoom out button, the latitude box, and the longitude box. These buttons offer an alternative means of accessing the map zoom, recenter, and pan functions.

3.2.3 Projections Menu Options

The projections menu (see Figure 3-3) offers the Flat Lat/Lon, Polar Stereographic, and HRAP projections.

The Flat Lat/Lon projection is the only projection offered by Hydroview/MPE in Builds 5.2.2, OB1, and OB2. It treats latitude and longitude as a rectangular grid which results in increasing amounts of distorting at higher latitudes.

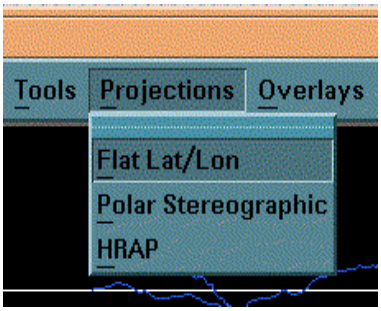

Figure 3-3. Projections menu options

The Polar Stereographic projection creates a more realistic map of the earth's surface. The spacing between lines of longitude decreases towards the north pole. This is also the projection that the HRAP grid uses. So, distortion in the MPE precipitation fields is minimized.

The HRAP projection is a specialized case of the Polar Stereographic projection in that it uses the 105 west longitude line as the reference longitude. Because a site's MPE forecast area is a subportion of the national HRAP grid, it will always appear as a rectangle when using the

HRAP projection. Hydroview_MPE takes advantage of this and attempts to fit the site's MPE forecast area as best as possible to the viewing area. Those familiar with the original MPE will recognize this projection as being the same as the one it used.

The HRAP projection offers another convenience. Selecting Areal Zoom or Ctrl+Z after any zooming, panning, or recentering operation will return the map view to the initial view. This can be very useful for cases where consistent screen captures of a several hours worth of precipitation data is required.

When Hydroview_MPE is first started, it uses the Flat Lat/Lon projection. The projection may be changed at any time.

3.2.4 Overlays Menu Options

Available Overlays

All Streams / Lakes
Major Streams / Lakes
No Streams/Lakes
Basin boundaries
Counties
County Warning Areas
RFC boundaries
States
Zones
Cities / Towns
Highways/Roads
Highways
Grids
Lat / Lon lines
Time zones
Radar Locations
Radar Rings

Figure 3-4. The overlays displayable in Hydroview_MPE.

The **Overlays** menu contains toggle buttons which can be used to enable or disable the display of the various overlays offered on the Hydroview_MPE application (see Figures3-4 and 3-5). The overlays are drawn on top of the spatial data such as the precipitation fields and the FFG grids. It should be noted that while it is possible to display multiple overlays at once, it results in an increase in the amount of time needed to redraw the hydrologic data when a display altering operation such as zooming or panning is performed.

By default, the Major streams / Lakes overlay and the State overlay are displayed when Hydroview_MPE is first started.

Figure 3-5. Overlays menu options

Overlays remain displayed when changing hours. Radar rings are a special case where if MPE data is being viewed, then they will change colors when changing hours to indicate the availability of data at the radar sites. A green radar ring indicates that there is radar data. A red radar ring indicates that there is no radar data. Note that radar ring colors do not change during a time lapse.

The management of the overlays and their sources relies on the **Hydroview_mpe_overlay_configuration** file located in hydroview's local data apps directory to specify the sources of overlay data. There is one row per overlay in this file, and each row contains information that controls how that

particular overlay is displayed, its default state upon startup of the application, whether or not it is stored in memory, and its source.

The power of the overlay configuration file is that it allows a user to switch overlay sources and properties with relative ease. For example, Hydroview_MPE overlay configuration file can be set up to use town and city data from the geodata sets, the WHFS City database table, or the FSL cities and towns lpi files. The overlays used by Hydroview_MPE come from several different sources which in turn have multiple formats that the program needs to be able to recognize and interpret. The overlay configuration file provides an efficient mechanism of informing the application where it needs to retrieve its overlay information from. The specific format of the overlay configuration file is covered in greater detail in the ***Hydroview_MPE Implementation Document***.

In OB3, the Set Font submenu has been added to the Overlays menu. This submenu allows five different font sizes to be chosen from. The font choices are Very Small, Small, Normal, Large, and Very Large. The default font size is Small.

3.2.5 Live Data Menu Options

Much of the core functionality of the Hydroview_MPE application is contained within the **LiveData**, **ReferenceData**, **Product**, **MPEcontrol**, and **MPEfields** menu items. The **LiveData** menu contains utilities for viewing and manipulating realtime data. (see Figure 3-6).

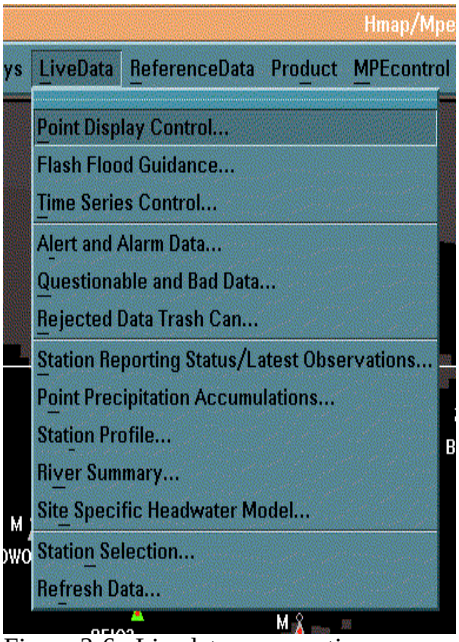

Figure 3-6. Livedata menu options

3.2.5.1 Point Display Control

The Point Display Control option provides a means of displaying forecast and observed data for specific locations in both a tabular and a graphical format. The point data displayed generally consists of one value per station. The control over the data selections is based on selecting the data as per its SHEF attributes. Much work has been done in OB3 to make the retrieval of the point data quicker and more efficient. However, the Point Display Control GUI still looks practically the same as in previous builds.

A control window is provided to manage the selection and subsequent display of the point data. The GUI window, shown in Figure 3-8, is described below. The description is given in terms of the primary "parts" of the window.

What follows is a summary of the Point Display Control feature. A complete explanation this feature can be found at:

http://www.nws.noaa.gov/oh/hod_whfs/HydroView/pointcontrol.pdf

3.2.5.1.1 Select data type to use.

Figure 3-7. Point Data Display GUI.

3.2.5.1.1.1 Specify primary element

This radio box selection dictates which PE table(s) to use to display data. The four explicit choices are River, Rain, Snow, and Temperature. The River item includes both the Height and Discharge tables. Note that when retrieving Precipitation data, the data are retrieved from the CurPrecip database table, not the Precip table.

An additional entry of "Other" is provided for the remaining elements. When this is selected, the single-select scroll list associated with the "Other" selections lists the dozen remaining elements that can be selected (Agricultural, Evaporation, Ground, Ice, Lake, Moisture, GateDam, Pressure, Radiation, Weather, Wind, Yunique). When the shef_procobs token is OFF, an additional item is also available in this list: "Processed". In this case, the list will have 13 items.

Whenever the primary element is selected, the PE and TS scrolled lists are updated (see below).

3.2.5.1.1.2 Select specific physical element (PE)

For the selected primary element, this list gives the unique SHEF-based PE entries available in the database table(s) associated with the selected element, as defined by the IngestFilter. For River, an additional item is listed ("Primary") that instructs the program to use the primary PE defined for the river characteristics in the station. For Precip, an additional item needs to be listed ("PC and PP"). This instructs the program to use the "best" value among the candidate PC and PP values.

3.2.5.1.1.3 Select specific type-source (TS)

For the selected element and given PE, this list gives the unique SHEF-based TS entries as defined via the IngestFilter. This is updated when the user selects a different PE. There is a toggle button that indicates whether the program should consider the TS when processing the request. If the toggle is set on, then only one TS can be selected. If the toggle is set off (i.e. "don't limit to a given TS"), then in the event of two values available for a given lid-PE combination, the one with the highest ts-rank will be displayed. The ts-ranking rule does not apply for Precip data; for Precip data, the PE-TS combination which has the most data, in terms of number of hours covered, is used. The TS list is not displayed when requesting River data for the "Primary" PE.

Notes:

Selectability/specificity: The primary key for the observed PE tables is: lid, pe, dur, ts, extremum, obstime and the key relates to the point control as follows. All lids are used, and one specifies the PE(s) to use. The duration is ignored, except for precip

data which uses it of course. The TS is either explicitly specified or the ts-ranking is used. The obstime is definitely considered, as discussed below. Lastly, only the daily min and max extremum codes are considered.

Available data choices: Because the GUI uses the IngestFilter to populate the PE and TS lists, note that the lists will include ALL possible entries, not just those entries that are within the database. This will allow much quicker response when loading these lists, since the actual PE table need not be queried It allows the option to display data as MISSING, in the event that a location should have data in the database table but doesn't.

3.2.5.1.2 Select data time reference

The time window for which data is retrieved depends on the value of the 3 time reference fields, all of which work together to determine the time window and the manner in which the time window is used. These three fields are described below.

3.2.5.1.2.1 Time mode

The time mode is specified as either: the latest time, a set time, the minimum, or the maximum.

When "latest" is selected for non-Rain requests, the program only considers data that are within the last N hours, where N is the hours value defined in the GUI (mentioned below). For precip requests, the top of the latest hour is used, and the N value gives the duration.

When "set time" is selected for non-precip requests, the program looks for data in the time window defined by the (center) time +/- N hours. For precip requests, the end time is used, and the N value gives the duration.

When "min" or "max" is selected, the program looks for data with the min or max (as selected) SHEF-based extremum code for the selected duration. The following durations are supported (the min and max codes, respectively are shown in parentheses): 1 hour (F, D, 3 hour (G, E), 6 hour (H, R), 12 hour (P, Y), 18 hour (I, S), 24 hour (N, X), one-week (M, W). If a duration is given that does not match one of these durations, then the next lowest SHEF duration is used. For example, if 11 hours is given, then a duration of 6 hours is assumed. The time window for which it looks for the min or max with the selected duration ends at the specified ending time, and begins at the ending time minus the duration * 1.5. For example, if the ending time is 18Z, and the duration is 6 hours, and the requested data is the minimum, then the application looks for data from 9Z (=18-6*1.5) to 18Z, with a extremum code of "H".

Note that there is no support for time modes of latest, min, or max when doing precipitation retrievals. The "set time" value is always used.

3.2.5.1.2.2 Ending/Center time

This multi-purpose field is used for all but the latest time reference option in a manner described above. The time defaults to the top of the most recent hour. Arrow buttons allow

adjustment of the time by hour or day increments, or the user can manually enter a time.

3.2.5.1.2.3 Hour

This multi-purpose field takes on different meaning depending upon the time reference option. See above for details.

3.2.5.1.3 Actions

The user can either display the data on a map, or the data can be displayed in tabular fashion. The retrieval of data is determined by the user controlled options specified in Parts 1 (Data to Use) and Parts 2 (Time Reference) of the window. The options given in Parts 4 and 5 affect how the data are filtered and presented to the user.

In addition to being able to display the data on a map or in a tabular fashion, the user may also clear the displayed data. In this case, all of the data will be removed from the map that it is being displayed on. In order to redisplay the data on the map, the user will need to select the "map data" option.

3.2.5.1.4 Select station filter

In Part 1 and 2 of the GUI, the user can control what data are to be considered for display. Part 4 allows the user to control which stations are to be considered from the set of data produced as per the instructions in Parts 1 and 2..

3.2.5.1.4.1 Data Source Filter

This station filter is specified by either the station's data "source(s)" or its service area assignments. Both the data source and the service area filter can be turned on and off via a toggle button. When turned on, the station is checked to see whether it has defined a source one or more of the selected data sources, or whether it meets the service area criteria, respectively.

The possible data sources are either: Observer, DCP, or Telemetry Type. A station is considered to have an Observer or DCP as one of its source if it has an entry defined in the Observer or DCP tables, respectively. The telemetry type is defined in the Telem table. The information about a station's data sources which is used by this filter is contained in the StnClass database table.

3.2.5.1.4.2 Service Area Filter

The station filter is specified by either the station's data "source(s)" or its service area assignments. Both the data source and the service area filter can be turned on and off via a toggle button. When turned on, the station is checked to see whether it has defined a source one or more of the selected data sources, or whether it meets the service area criteria, respectively.

In OB3, the service area filter has been simplified. Filtering is only performed according to the responsible WFOs. When multiple responsible WFOs are selected in the service area

filter, the filtering is done by using a logical "OR" of these WFOs. For example, if A, B, and C are three responsible WFOs and A and C have been selected in the Service Area Filter, then a station will be displayed if it has A or C as a responsible WFO.

3.2.5.1.4.3 Suppress Missing/Suppress Zeros/Suppress Non-Fcst Points

The filter also allows suppression of missing values and/or suppression of zero values and/or non-forecast points. The suppression of zeroes is typically only useful for Rain data requests.

When adding "missing" entries, the application uses the information in the IngestFilter table, to determine which station should be there, and for those stations which do not have a value, a "missing" entry is appended to the list of data. One interesting implication of this is that if suppressing non-forecast locations and not suppressing missing data, then one might expect to see all forecast points. However, if for a given data type, a forecast point has no data, as indicated by the IngestFilter entries, then a missing report will NOT be listed for the forecast point location. Because adding missing data requires a query of the IngestFilter table, note that including missing table takes slightly more time that suppressing missing data.

If data are found for an area id, for which no location information is defined, then the value is filtered out automatically. When filtering data, stations that have the "no-post" switch are ignored.

3.2.5.1.5 River Basis and Map Options

3.2.5.1.5.1 River Basis

This option applies to both tabular and geographical displays. For displays of river data, the user can specify whether to user the latest observed, the maximum forecast, or the maximum of the two. This option applies to both tabular and geographical presentations. Note that the stage basis only applies for the time mode option of Latest.

3.2.5.1.5.2 Map Options

These options only apply to the map display. At most, for each location, the map display shows 1) the icon, 2) the value, 3) the time, 4) the location id, 5) the location name, 6) and possibly second value for the flood stage. The user can toggle the display of the first 5 items. When turning off the display of the value, the display of any second value is also turned off.

Also, for river data, the value can be either the value itself or it can be the departure from the flood level. This option is only meaningful for geographical displays; for tabular displays, both sets of values are always shown.

The Display River Status toggle button has been added to the Point Display Control GUI in OB3. It allows the coloring of the river stations to be enabled and disabled. The coloring of the icons is independent of the query constructed using the point control GUI. That is, the coloring of the icons always represents river status regardless of PE and TS have been selected. So, there are actually two layers of point data information being displayed - the user selected point data and the river status conveyed through the icon colors. The icon coloring

scheme uses green to indicate a station whose observed or forecast river stage is below the action and flood stages. Yellow indicates that the river stage is at or above the action stage but below flood stage. Red indicates that the river stage is at or above flood stage.

The display of the river status colors does require a little extra time. For sites which are not concerned with the river status information, the Display River Status toggle button may be used to turn it off.

3.2.5.1.6 Additional Notes:

When selecting tabulate or map data, the application does NOT normally re-retrieve the data if no data options have changed (i.e. those options located above the tabulate and map buttons). If the refresh time has passed (e.g. 15 minutes) then a new retrieval is always performed when selected in the tabulate or map buttons, regardless of whether any option have been changed. Avoiding unnecessary retrievals of data is very helpful in improving the performance of the application. If non-data options are changed, such as the filter options and data display options located below the tabulate and map buttons, there is no need to re-retrieve the data.

When invoking the time-series from the tabular listing, there are times when an exact match for the PE-TS-DUR-EXTREMUM key is not possible. In this case, when the time series (graph or map) is invoked, the best it can do is to bring up the control window for the given station, without displaying the actual tabular or graphical window. The classic case where this occurs is for precipitation data, which has a duration assigned by the point control function which probably does not match any duration found for a key in the appropriate data records.

The tabular display shows the flood level and departure from flood level, if the flood level is available, and if H* or Q* data are being displayed. The flood level is given in units if stage or discharge, depending upon the Primary PE designation in the RiverStat table. Also, if the action level is set, then the value is compared to this level. If it exceeds the action level, then the entry in the tabular list for this station denotes that the level was exceeded (>ACTION!!).

3.2.5.1.7 Tokens:

The following existing tokens are used by the point control function:

hv_durhours - Specifies the initial duration in hours that applies to the time window used for the retrievals. The token value is simply a positive integer value. If no token value is defined, a value of 24 hours is assumed.

hv_pets - Specifies the initial PE and the optional TS value for which data will be retrieved. The value is either the keyword “PRIMARY”, “PCPP”, or <PE>, or <PETS>, where PRIMARY implies the River data type using the Primary PE,

PCPP implies the Precip data type using the best PC or PP based value, <PE> is simply a specific physical element value, and <PETS> is a specific PE-TS combination. When specifying the physical element in the <PE> or <PETS> form, only a River, Precip, Temperature, or Snow PE can be given; the "other" PE values are not recognized for this token. If no token value is defined, a value or PRIMARY is assumed.

hv_riverbasis - Specifies the initial setting indicating which type of value is used to base the single, representative value for river values. The possible values are "obs", "fcst", and "maxobsfcst", where "obs" implies use of the latest observed value, "fcst" implies use of the maximum forecast value, and "maxobsfcst" implies use of the maximum of the two. The single value so obtained is used to color the river icon on the main geographic display, and can also be listed using the tabular fashion. If no token value is defined, a value of maxobsfcst is assumed.

shef_procobs - This controls whether the list of "other" table includes Processed or not, and where to find data with a TS of P*. If set to ON, then Processed data are co-mingled with observed data, so the other list will not include Processed data, and the TS=P* data will be expected to be in the applicable PE table.

shef_post_latest - If this is set to ON, then retrievals for Latest data use this data table, which results in retrievals which are much faster.

One new token is provided as part of the point control features in OB3:

hv_pointdata_display - Determines whether or not point data is displayed upon the start up of Hydroview_MPE. It may be set to "ON" or "OFF". If set to "OFF", then no point data processing is performed. This can shave a considerable amount of time off of the start up of Hydroview_MPE. For sites which do not regularly use the Point Display Control, this is the option of choice. Note that when this token is set to "OFF", there will be a delay the first time the Point Display Control is launched in and Hydroview_MPE session.

3.2.5.2 Flash Flood Guidance

Hydroview_MPE has the capability of displaying either gridded or areal Flash Flood Guidance (FFG). The Flash Flood Guidance GUI is accessed from the **Flash Flood Guidance** option under the **LiveData** menu. This simple user interface gives the forecaster the ability to choose FFG data based upon its forecast area, duration, and valid time. The gridded FFG data is displayed on a HRAP grid while the areal FFG data is displayed at a county, zone, or basin resolution.

The Flash Flood Guidance GUI consists of five sections: the FFG mode selection section, the product selection list section, the display control section, the filter options section, and the color legend.

Figure 3-8. The Flash Flood Guidance GUI

The FFG mode selection allows the selection of gridded or areal FFG data. These two "types" of FFG data are distinguished by their resolution. Gridded FFG is displayed at an HRAP grid resolution. Areal FFG is displayed at a county, zone, or basin resolution. Gridded FFG is read from netCDF files while areal FFG data is read from the ContingencyValue table in the IHFS database. They are displayed differently. The gridded FFG data is represented by colored regions on the Hydroview_MPE display. Areal FFG data is shown by area identifiers and FFG values which are colored according to FFG value.

Each row in the FFG selection list box contains the FFG forecast area, the duration of the FFG product and the product's valid time. Only one FFG product may be selected from this list at a time. When a product is selected, it may be displayed either by double clicking on its list box entry or by pressing the select button below the list box. The data may be cleared from the Hydroview_MPE display by pressing the Clear button.

The filter and options section contains tools for controlling which FFG products are displayed in the product select list. The options are slightly different depending upon whether gridded or areal FFG is being viewed. The gridded FFG may be selected according to the FFG forecast area type (e.g. WFO or RFC), the FFG forecast area name (only available for RFC forecast areas), the product duration, and whether to display the data in its native HRAP grid format or as a mean basin FFG value.

The areal FFG products may be selected according to the area type (basin, county, or zone) and the product duration. Two toggle buttons are provided to switch on and off the display of the area identifiers and FFG values.

The final portion of the Flash Flood Guidance GUI is the color legend. It automatically updates when a product is selected from the product selection list to be displayed. It shows the values associated with each of the colors used to represent the FFG data.

This FFG information can be used in conjunction with the multi-sensor precipitation estimates to monitor the threat of flash flooding.

3.2.5.3 Time Series Control

This application extracts data from the IHFS database and allows the user to plot the data in conventional X-Y time series plots, to display data in a tabular time series form, and to perform data editing graphically or through the tabular display. The operation of the Time Series Control window, shown in Figure 3-9, is described in the following online document :

http://www.nws.noaa.gov/oh/hod_whfs/TimeSeries/TimeSeries_521.pdf.

3.2.5.4 Alert and Alarm Data Option

Displays data that have exceeded alert and alarm thresholds based on value and/or rate-of-change quality control parameters. The option menu buttons across the top of the Alert and Alarm Data Values GUI control the data records that are displayed in the large text area. The user has the option to display observed, forecast, or both observed and forecast alerts and alarms. The user also has the option to display alerts only, alarms only, or both alarm/alerts data records. The alerts and alarms may be displayed based upon the value of the data, the rate of change of the data, or both of these limits. The output displayed in the text area may be sorted by the Time of the data or the Location Identifier of the data.

The header of the Alert and Alarm Data Values list box contains the following information:

Location - station's location identifier.
Name - name of the station
PE - physical element
Dur - duration
TS - typesource
Ext - extremum code
Value - value
ROC - rate of change
QC - quality control flag
ThreatDescr - indicates an alert or an alarm
Valid Time - valid time of the report
BasisTime - basis time of the report

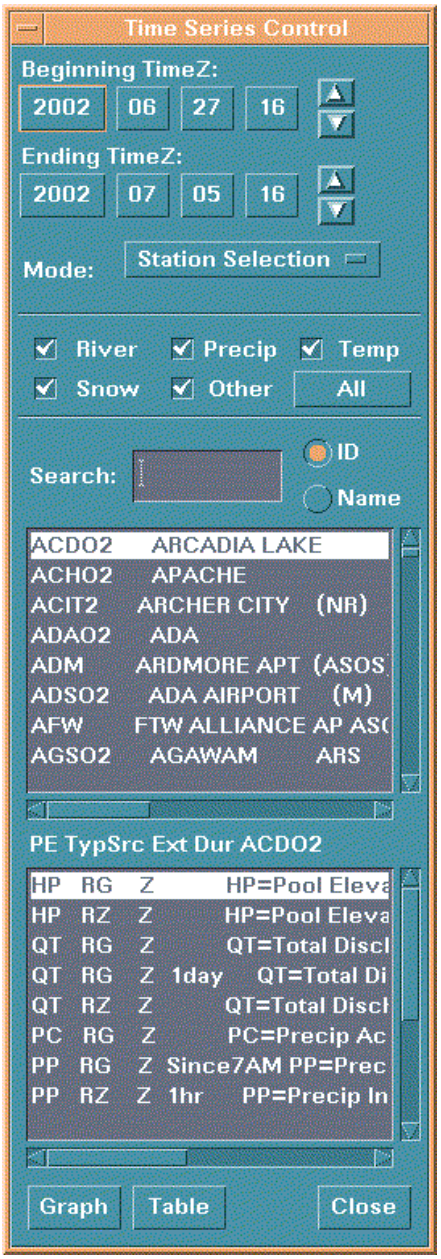

Figure 3-9. The Time Series Control GUI

Clicking on an item in the station list will select it and display preset product, alert/alert values, rate-of-change, posting time, and time last reported in the text boxes below. The Tabular Time Series / Graphical Time Series option buttons allow the value to be viewed within its complete time series context and edit real time data. See the description of the

Time Series application above for more information.

Note that the information presented in the Alert and Alarm Data Values GUI is read_only. Changes to data or alert/alarm limits cannot be made.

3.2.5.5 Questionable and Bad Data Option

This window displays all data that have been marked as questionable or bad by the quality control processes. No information or data can be typed or edited in this window except entering the station location, setting the number of days back, and deleting highlighted rows. The "Filter By" option allows the data anomalies list to be filtered by Location (type the location identifier and press enter) and/or by a certain observation type (click on an observation type in the pull down list). The default is to display questionable or bad river stage values for all locations.

Next to the "Filter By" options is a text entry window which provides the ability to select the number of days back to look for the questionable/bad data. After entering the number of days back to search, the user must hit the enter key for the search to take place. Finally, the listing of questionable/bad data may be sorted by either the location identifier or the time (starting with the most recent observation).

The header of the questionable/bad data viewing area contains the following information:

Location - location id
Name - location name
PE - physical element
Dur - duration code
TS - type source
Ext - extremum
Value - observed value
Observation Time - date and time of the observed value
RV - revision or not to the data: T = revised, F = no revision
SQ - SHEF qualifier
QC - quality control code: Q = questionable, B = bad, G = good
Product - product id
Time - date and time of the product
Posted - date and time of the data posted to the database

Within the table the user may click on an item to highlight it and display the quality control data description. The description can be read in the "QC Description" section below the table. The description gives the user a general idea why the data is questionable or bad. At the bottom of the screen the user may view the highlighted item using the "Tabular Time Series" or "Graphical Time Series" buttons. The option "Set Missing" allows the user to change the data from its numerical value to "missing". Highlighted data rows may be deleted by clicking on the "Delete Selected" button. The "Close" button pops down the window.

3.2.5.6 Rejected Data Trash Can Option

The Rejected Data Trash Can window can be used to display manually or automatically rejected observations, move them to data tables, or delete them from the IHFS database. Data that are not removed or deleted from this list are purged after the retention period has elapsed. This purge parameter is configurable from Hydrobase. The user can filter rejected data by clicking on the "Filter By" options which are arranged across the top of the "Rejected Data Trash Can" GUI. This filtering may be done by the location (which may be done by selecting the "Location" check box and entering a location id in the adjacent text area), the physical element (which may be accomplished by selecting the "Phys. Elements" check box and selecting the element from the adjacent list box) or a combination of the two. In addition to this, the rejected data can be filtered based on whether the report was rejected by a manual process, automated process, or both. The output in the rejected data viewing area may be sorted by location or time (starting with the most recent product time stamp).

The header of the rejected data list displays the following information:

Location - Location id
Name - Station name
PE - Physical Element
Dur - duration code
TS - type source
Ext - extremum
Value - observed value
ObsTime - observation time
BasisTime - date and time when a forecast was made for forecast data
RV - indicates if the data has been revised: T = revised, F = no revision
SQ - SHEF qualifier
QC - quality control code: Q = questionable, B = bad, G = good
User - the user id that was used to check the data (awipsusr , SHEFdec)
Type - type of process that checked the data (manual or auto)
PostTime - date and time that data was posted to the database.
Product - product id
ProductTime - date and time of the product

There are a couple of options in editing the rejected data list. The "Move Selected to Data Tables" button allows the user to move the selected item from the rejected data depository to the appropriate physical element table in the database. The application automatically determines the correct physical element table to insert the rejected report into. Likewise, the data can be deleted individually by highlighting the item and then clicking on the "Delete Selected" button. All items in the rejected data list can be deleted by clicking on the "Delete All" button. A warning dialog verifies that the user really does want to delete all of the data.

3.2.5.7 Station Reporting Status/Latest Observations Option

This GUI reports the status of all of the forecast and observation sites within the HSA. The data is displayed according to the "List" and "Sort" option menu buttons across the top of the GUI. From the "List" option menu, the stations displayed may be chosen according to the latest data for all locations, only those stations with data older than a user-specified number

of hours ago, and those stations without any latest data at all. For the option where the user is attempting to display locations with data older than a specific number of hours ago, the user must enter the number of hours in the "Hours Ago" text area. The display of the data may be sorted by either the location identifier or the observation time stamp.

The large text area below the sort options displays a listing of all of the stations that meet the user's search criteria. The headings across the top of this list box are:

Location - location id
Name - station name
Observation Time Z - observation time of the report
Latest Data Posted Time Z - latest posted time

When one of these stations is selected from the list, a listing displaying all of the latest data for the station is shown in the "Latest Data for Selected Location" list box in the bottom half of the GUI. The headings across the top of this box are as follows:

Location - location id
Phys Elm - Physical Element
Dur - duration code
Typ Src - type source
Ext - extremum
ObsTime - observation time
Value - observed value
SQ - SHEF qualifier
QC - quality control code: Q = questionable, B = bad, G = good
RV - indicates if the data has been revised: T = revised, F = no revision
Product Id - product id
TimeZ = date and time of the product
Posting TimeZ - date and time that data was posted to the database.

Below this list box are four non-editable text fields displaying, from left to right, the current time, the period in minutes that telemetry reports are received from the selected station, the period in minutes that DCPs are received from the reporting station, and the starting time in minutes. With the exception of the "Hours Ago" text entry box at the top of the GUI, all of the other fields cannot be edited.

3.2.5.8 Point Precipitation Accumulations Option

This option can be used to display precipitation accumulation data for a set of stations. By default, precipitation accumulations are calculated for a 24 hour period ending at 12z of the current day. The output is listed in the large list box that occupies the bottom of the point precipitation accumulations GUI. However, the application offers great flexibility in determining the duration and source of the precipitation data tallied and displayed. An important aspect of this GUI is that data are not displayed until the "Load Data" button is clicked on. This enables the user to retrieve the most up-to-date precipitation data.

The filter options are displayed across the top of the GUI. If the precipitation totals for a

single station are desired, then the "Location" check box must be selected with the identifier of the station being entered into the text entry box. The user may select the data source of the PC and PP precipitation observations by highlighting and unhighlighting the data source names in the "PC/Ctr" and "PP/Inc" list boxes. Control of the duration over which the precipitation estimates are being tallied is provided by the "Endtime/Durs" endtime selection and duration selection boxes. The endtime is the time at which the duration ends. The duration is the amount of time over which precipitation amounts are tallied (1,3,6,12, 24,48,or 72 hours).

In addition to the options to filter by location, data source, and time, the data displayed may be further enhanced by selecting one or both of the two "Options" check boxes. The "Show Details" box, when checked, causes all of the contributing precipitation observations during the duration for a particular station's precipitation total to be displayed. Each of these reports shows the value for the physical element being processed (either PP or PC), the time of the observation, the duration of the observation (if PP), the extremum code, the data qualifier, and the quality control flag. The "Add PP reports as needed" check box provides a means of supplementing PC type precipitation observations with PP observations.

The displayed point precipitation accumulations may be sorted by location or value in descending order. Across the bottom of the GUI are three push buttons, "Close", "Save", and "Print". "Close" closes the application, "Save" allows the precipitation data to be saved to a disk file, and "Print" allows the generation of a hard copy of the precipitation data.

3.2.5.9 Station Profile Option

This option provides a means of displaying geophysical information and current stage data for the currently selected station and other stations along the same river. The station information and data includes the station identifier with the latest stage and associated time and date, a color coded stage bar, and the actual elevation of the station in feet above mean sea level. A green stage bar indicates a below flood stage river level, a yellow stage bar indicates a river level which is above the action stage, and a red stage bar indicates a river level which is above flood stage. The ordinate (y-axis) of the profile is in feet above mean sea level. The abscissa (the x-axis) is in river miles.

Information for the individual stations along the reach may be displayed through the "Stations" option menu button just below the graphical profile. For a station, its name, reach, action, and flood stages are displayed. Note that none of these fields are editable from this GUI.

3.2.5.10 River Summary

The "River Summary" application provides a means of viewing the river stages of stations points along a single river or stream. This is actually a stand alone application which is launched from Hydroview when the "River Summary" option is chosen. The River Summary GUI is relatively simple, consisting of a list of streams in the upper left, an options pull down menu in the upper right, and a graphical river summary across the bottom half of the GUI. When a stream is selected from the "Stream List", the river summary graphic is automatically updated to display the staff gages of the observation points along the river. These staff gages use green to indicate stages below the action stage, yellow to indicate levels at or above the

action stage but below flood stage, and red to indicate levels at or above flood stage. If the actual river stage data exists, then it is displayed as blue along with its value within the staff gage.

Below each staff gage is the date and time of the observation, the gage identifier/river mile, and the full name of the site. If the staff stage graph is missing, then the text "MSG Flood Stage" is displayed below where the staff gage would have been drawn. If the stage data is missing, then the text "MSG Stage Data" is displayed. The user has the option of displaying only observed stages, only forecast stages, or the maximum of the observed and forecast stages.

3.2.5.11 Site Specific Headwater Model Option

This is a stand alone application which allows the user to manipulate the rainfall over the head waters of individual streams and rivers. It is an interactive Java-based program that enables the user to run a hydrologic model to generate a river stage forecast based upon observed and forecast rainfall amounts.

The main window of the site specific application contains information about the current station being examined and the hydrologic model being used to estimate the river stages. It only has two menubar options, "File" and "Help". The "File" menu contains the "Quit" option. The "Help" menu contains the "About" option. When selected, the "About" option displays the current release version and date of Site Specific.

Drop down menus across the top of the main GUI allow for the selection of the station and the hydrologic model to use in the computation of the river stages. Below these menus are portions of the GUI which contain station location information and settings for the precipitation analysis time period. Information outlined in the "Station Location Information" portion of the GUI includes the flood stage in feet, the flood flow in cubic feet per second, the UHG peak flow in cubic feet per second, the threshold runoff in inches, and the drainage area of the basin in square miles. Within the "Time Period for Precipitation Analysis" portion of the GUI, the user may select the start time of the 1-hr FFH (Flash Flood Headwater) from the pull down start time menu. The end time of the period may be set by first selecting the time field to modify in the "Modify End time" pull down menu and then using the "+" and "-" buttons to modify that field in the end time.

Clicking on "Initial Analysis Window" displays a separate GUI containing two graphs. The abissca of both graphs is time. However, the ordinate of the top graph is inches of precipitation while that of the lower graph is river stage in feet. The top plot displays hourly precipitation amounts while the lower plot shows the change of river stage with time (as a function of the precipitation amounts plotted in the upper graph).

These graphs are a combination of both observed and forecast values. Depending on the duration period selected the time plots will usually include several hours of observed values followed by several hours of forecast values. On the graphs, the current time, which is the division between the observed and forecast values, is shown as a vertical yellow line. Observed river stage values are shown as yellow points while forecast river stage values are drawn as cyan points. A red line representing the flood stage for the site can be toggled on and off via the "Show Flood Stage" check box. The observed river stage data in the lower

plot may be toggled on and off by clicking on the "Show Observed Data" check box.

Below the graphs are controls which allow for the modification of hourly rainfall and stage data. The "Edit MAPs" button allows the hourly mean areal precipitation amounts to be modified. The "Edit Stage" button allows the hourly forecast stages based on the hydrologic model to be altered.

The changes made to the forecast river stages may be saved to the database by clicking on the "Save to Database" button which saves this information into the fcstheight table of the ihfs database.

3.2.5.12 Station Selection Option

This option lists the stations that are currently displayed according to the point control options. Any of the stations in the list can be selected with a simple single click. The station's name will become highlighted in the list box and a red rectangle will be drawn around the station's location on the Hydroview_MPE display. Only stations that are currently visible on the display are included in the Station Selection list box.

Double clicking on any of the stations in the list will not only highlight the station's location on the map by drawing a red rectangle around it, but also it will launch the Time Series Control GUI for the station. This will enable the user to tabulate or plot a time series for a specific physical element for the site.

3.2.5.13 Refresh Data Option

This option refreshes the point data displayed on the Hydroview_MPE display. This option does precisely the same thing as the timed refresh which automatically occurs after a fixed number of minutes as dictated by the "hv_refresh_minutes" token.

3.2.6 Reference Data Menu Options

The reference data options provide useful information about specific locations. A station must first be selected on the map display (either by double clicking on it or by selecting a station in the station list) for the reference data utilities called from the reference data menu to work properly (see Figure 3-9).

3.2.6.1 Staff Gage

This window displays gage background information for a selected station. This GUI is broken up into two main frames, the Reference Frame and the Significant Stages Frame. The Reference Frame contains text fields specifying the name, basin, stream, county, state, lat/lon, elevation, and tidal effects of the site. The Significant Stages Frame contains a drawing of the actual staff gage for the site along with text fields specifying the numeric values of the important stage levels. The graphical staff gage is color coded with green indicating river levels below the action stage, yellow indicating river levels at or above the action stage, and red indicating river levels at or above flood stage. Also, the staff gage indicates the actual

values of the action and flood stages along with representative river stages for minor, moderate, major, and record floods.

This display is read-only. Changes cannot be made to any of the text fields.

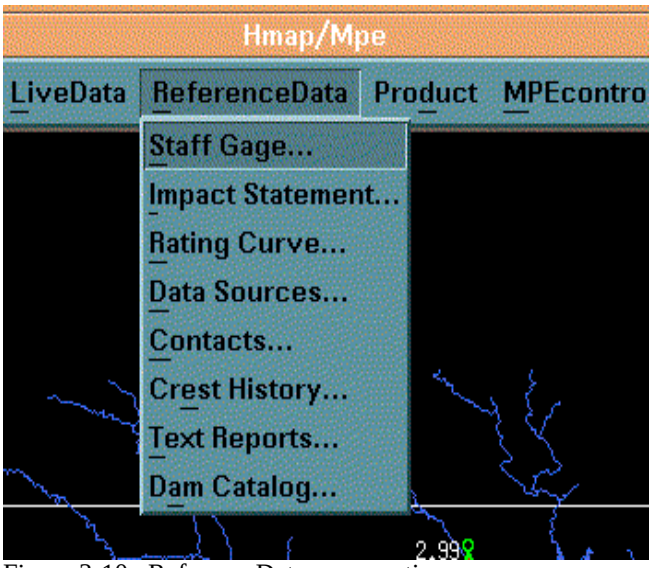

Figure 3-10. ReferenceData menu options

3.2.6.2 Impact Statement Option

This option displays impact statements for various river stages at a specific station. This interface contains three major components: a list box containing stages in descending order, a characteristics frame containing the stage value, tendency, and begin and end times if the impact statement is a seasonal one (such as at a recreational area). The bottom portion of the Impact Statement GUI is a Text Area displaying the actual impact statement. By selecting different stages in the top list box, the characteristics and impact statement are updated accordingly.

The user has the option to save the impact statements to a flat file (through the “Save to File” button) or to send the entire report to the printer (through the “Print All” button). Note that this GUI is read-only. Any modifications to the data are not saved.

3.2.6.3 Rating Curve Option

The rating curve is a simple window that presents the relationship between the river’s stage and its discharge. On this graph, the flood stage is illustrated as a red line while the record high river stage is shown as a blue horizontal line. The ordinate of the graph is the stage in feet with the abissca representing river flow in 1000's of cubic feet per second.

In addition to the graph, there is also a scrolled list which displays the values of stage and discharge for each of the points in the rating curve. This GUI is read-only. Changes are not permitted to the text boxes containing the stage and discharge information.

3.2.6.4 Data Sources Option

This window provides a means of browsing the data sources for a selected station. The “Type” option menu button at the top of the GUI informs the user of how the reports are collected and generated for this site. The possible types are Data Collection Platform (DCP), an observer, or telemetry. The GUI reconfigures itself to provide information that adequately describes the type of the data source.

For DCP, the GUI contains a field describing the owner of the DCP, the GOES identifier of the product, the reporting time of the platform and how often (the frequency) the platform

reports. The GUI also contains any special criteria governing the platform's reporting of data.

For an observer, the GUI reconfigures itself to display the observer's name, address and contact information. It also displays information about how the observer reports the observations, who sponsors the observer's work, how much the observer is compensated, and the task number of the contract that pertains to the observer.

For observations taken by telemetry source (for example, ASOS or a mesonet), the "Data Sources" GUI reconfigures itself to display information about the telemetry source, the owner of the telemetry equipment, and who pays for the telemetry station. The cost of the data, the sensor identification string, and the frequency with which reports are issued are also displayed. A telephone number is provided as a source for further information. Any relevant criteria are display in the "Criteria" text area.

3.2.6.5 Contacts Option

The contacts GUI displays contact information for a location. This can be helpful when there is a problem with an observation site's data or a special measurement needs to be made during high water situations. The scrolled list across the top of the GUI has the headers "Sequence", "Contact", and "Phone". In this scrolled list are listed all contacts, i.e. the names of people or organizations that may be called when more information or immediate action is required at a remote site. When one of the items is selected from this listing, the fields in the "Information" frame updates to display more detailed contact details for the selection.

Note that the sequence number is supposed to indicate the order in which people are contacted. Someone with a sequence number of "1" should be contacted before someone with a sequence number of "2". The "Concerns" field contains special instructions pertinent to the selected contact. Many times, the "Concerns" field will contain after hours contact information for organizations that may only be staffed during the day.

3.2.6.6 Crest History Option

The crest history window provides a historical lookup of previous floods, their maximum river stage (crest), their flow at the crest stage, the date the crest occurred, and the time the crest occurred. The display consists of a graphic which displays each individual crest with a colored "X" plotted relative to the levels of the minor, moderate and major flood levels. The colors used to represent these three divisions of the flood stage are red, blue, and purple, respectively, and the "X" for the crest is given the color of the stage that it is at or above. Green is used for plotting crests which are below the flood stage

The crests which are plotted on the graph are also listed in the scrolled list in the top right corner of the GUI. When a crest is selected from this scrolled list, its corresponding plot on the crest history graph is highlighted in white and detailed information for the crest is displayed in the fields within the "Info for Selected Crest" frame. A crest may also be selected by clicking its "X" on the crest plot. Which crests are displayed on the plot and consequently in the list box can be controlled through the "Filter Crests By" option below the plot. It offers the ability to display only those crests which are above the action stage, only those which are below the action stage, or all crests. The listed, textual crest information can be sorted in descending order according to stage, flow, or crest date.

The “Info for Selected Crest” frame contains information specific for the crest currently being displayed. This information includes the stage of the crest, the flow or discharge of the crest, the date of the crest, and the time of the crest. The frame also contains check boxes which indicate how the crest observation was arrived at and any additional remarks that may be useful for interpreting the crest.

3.2.6.7 Text Reports Option

The text reports window provides the ability to generate, print, and save to a file three types of reports: E-19, E-19A (Summary), and B-44A (Cooperative). It also provides the ability to create, print, and save to a file a sorted list of stations, a list of station class information, and a sorted list of service backup information. The list of stations may be sorted by either the location identifier, the location name, the county, the basin, or the observer. The service backup list may be sorted by the station identifier, WFO, primary backup, or the secondary backup.

The reports that may be generated by this utility can be accessed via the “Report” option menu button. The sorting options are only available for the “Sorted Station List” and the “Service Backup”. For the E-19 report there is a “Page” option menu button which allows quick access to a large number of sections of the report.

The printing and saving of data are respectively controlled by the “Print” and “Save” buttons at the bottom of the application.

3.2.6.8 Dam Catalog Option (This option is not available on Linux)

An alternate function is now available for the Dam Catalog.

3.2.7 Product Menu Options

As shown in Figure 3-11, the product menu contains only one option, “Product Viewer”.

3.2.7.1 Product Viewer Option

The product viewer window provides the ability to view IHFS products (such as River Statements and Flood Warnings) that have been stored into the database. The “Product Viewer” GUI consists of a scrolled list containing products that meet the user selected searching criteria. When a product is selected from this list by clicking on it, if it can be found in the database, then its contents will be displayed in the large text area that occupies much of the bottom of the “Product

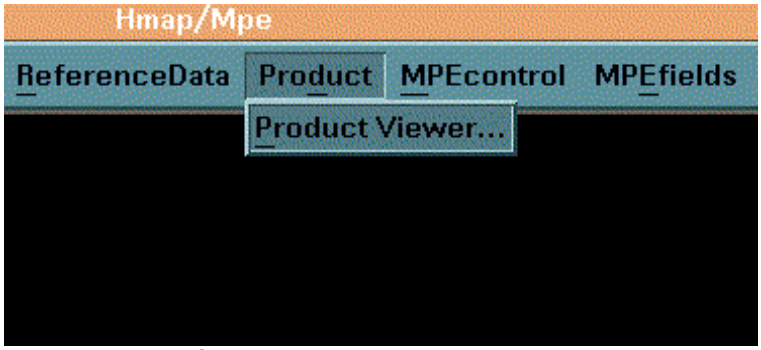

Figure 3-11. Product menu options

Viewer" GUI. The products may be displayed according to the three options shown on the "List" pulldown option menu: "Products for Selected Location", "Latest Product by Product Identifier", and "Text Products in Database". The "Products for Selected Location" option relies on a station having been selected by the user before the Product Viewer was launched. If no station was selected, the identifier of the station must be typed into the "Selected Location" text field. If a station was selected on the Hydroview_MPE display, either by double clicking on it or using the station selection utility, then its identifier will automatically appear in the "Selected Location" text field when the application is started.

The "Latest Product by Product Identifier" option selects the most recent product for each of the available product identifiers in the database. The "Text Products in Database" option displays all of the products that are actually in the database. The output in the product information text box can be sorted according to the product identifier, the product time, and the posting time. Products of a specific id can be displayed by entering the exact identifier into the "Product Id Filter" text field.

3.2.8 MPEcontrol Menu Options

The MPEcontrol menu together with the MPEfields menu provide the Hydroview_MPE multi-senor precipitation editing and viewing capabilities. None of the MPEcontrol or MPEfields menu items are accessible until an hour for displaying the MPE data has been chosen from the "Choose Hour ..." menu item. Once an hour has been selected the other MPEcontrol and MPEfields menu items are automatically desensitized and made selectable (see Figure 3-12).

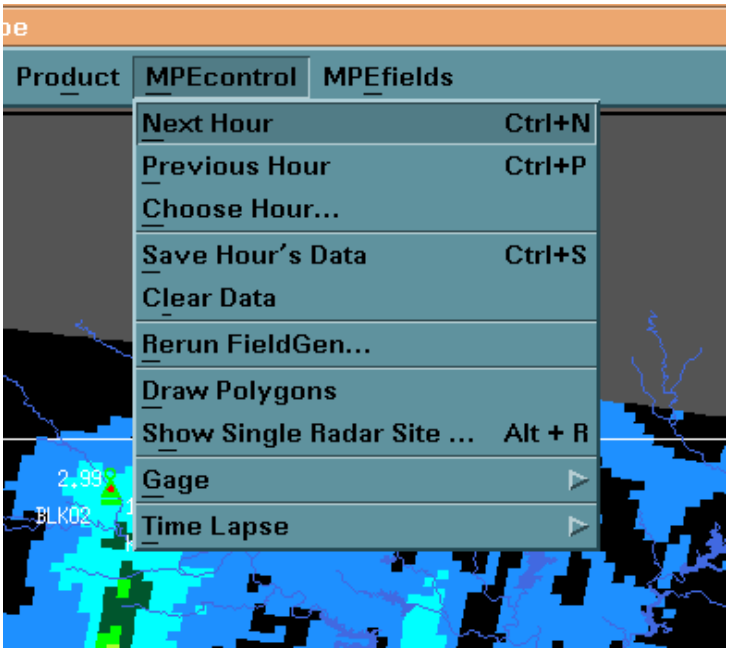

Figure 3-12. MPEcontrol menu options.

3.2.8.1 Next Hour Option

The next hour option selects and displays the next hour's worth of MPE data. The application keeps track of the specific data field that the user is looking at so that the same product can be properly loaded for the next hour, producing continuity for viewing the products while making sure that the user does not have to reset the field type every time a new hour is selected.

For the radar mosaic, mean field bias radar mosaic, local bias radar mosaic, gage-only analysis, multisensor mosaic, and best estimate QPE, when the next hour option is selected and the field currently being viewed has not been saved, a warning dialog box is launched stating that the data has not been saved. This dialog box gives the user the option to cancel the next hour callback and save the data first or to discard any changes made and continue to load the next hour's worth of data.

3.2.8.2 Previous Hour Option

The previous hour option selects and displays the previous hour's worth of MPE data. Like the next hour option, the application keeps track of the specific field the user is looking at so that the same product can be properly loaded when showing the previous hour's data. Again, this provides continuity for viewing the products while making certain the user does not have to bother with resetting the field type every time a new hour is selected.

For the radar mosaic, mean field bias radar mosaic, local bias radar mosaic, gage-only analysis, multisensor mosaic, and best estimate QPE, when the previous hour option is selected and the field currently being viewed has not been saved, a warning dialog box is launched stating that the data has not been saved. This dialog box gives the user the option to cancel the previous hour callback and save the data first or to discard any changes made and continue to load the previous hour's worth of data.

3.2.8.3 Choose Hour Option ...

The choose hour window provides the ability to select a date and a time for which to display an hour's worth of MPE. This window shows a table of allowable hours that may be selected for processing. The number of entries in this table is controlled by the num_hours_wind field in the IHFS RWPrefs table. There are three columns of information in the main window of the choose hour GUI. The first column, labelled "Hour of Run", lists the date/hour to be selected for MPE processing. The hour specified is the end of each hourly period of rainfall accumulation. The second column, labeled "Last Saved", shows the last time that a field was saved for the given hour. If "n/a" is displayed in this column, it means that a field has not previously been saved for this hour. The third column, labelled "Last Input", shows the last hour that the MPE_fieldgen process was run for the hour listed in column 1. A "n/a" in this column indicates that a MPE_fieldgen run for the hour has not yet been done. The times displayed in columns one, two, and three are GMT.

The first date/hour listed in the choose hour window by default is the current date and hour. Note that this can be changed by specifying the date/hour in the form yyyymmddhh (Z time) as an argument to the "-t" option on the command line of the call to the Hydroview_MPE application in the start_hydroview_mpe startup script. This is a change from the MPE application which accepts the date/hour of the historical precipitation event as stand alone command line option without a '-t'.

A date/hour is selected from the "choose hour" window simply by clicking on it with the mouse. To display the data for that hour, simply click on the "OK" button at the bottom of the GUI. The "Cancel" button pops-down the "choose hour" window. The "Help" button launches the Help window which provides help about a variety of Hydroview_MPE topics.

3.2.8.4 Save Hour's Data Option ...

Choosing this option saves the currently displayed MPE precipitation field as the "best estimated" precipitation field for the hour. It is saved as a xmrg-formatted file. When a file is saved, a record is written to the IHFS RWResult table containing the filename, the id of the user running the Hydroview_MPE application (as indicated by the LOGNAME

environmental variable), and the date/time that the file was saved. Note that missing values are replaced by 0.0 in the precipitation field before creating the xmrg file. This is done specifically for MAPX, an OFS function which relies on these xmrg precipitation estimates not being missing.

The option to save the best estimate precipitation field only exists for valid precipitation fields. Reference data fields, which include the "Radar Coverage", "Height", "Local Span", "Local Bias", and "Prism" fields under the "MPEfields"menu, cannot be saved as best estimate data.

The "Save Hour's Data" option will also save the data in a netCDF format, gif format, jpeg format, or in grib format depending on the values of the "mpe_save_netcdf", "mpe_save_gif", "mpe_save_jpeg", and "mpe_save_grib" tokens in the .Apps_defaults file(s). When saving gif and jpeg images, make sure that the MPE main window is on top of the window stack until the confirmation message is printed. Failure to do this will result in creation of an image with other windows obscuring the main window.

3.2.8.5 Clear Data Option ...

This is a new option. Since Hydroview and MPE are merged applications, it is necessary to provide a way of clearing the MPE data from the screen if the user wants to work solely with the Hydroview point datasets. The "Clear Data" button has been provided to erase any MPE information from the Hydroview_MPE display. Note that once this data has been erased, the only way to redisplay the data is to select a new date/hour from the "Choose Hour" menu item.

3.2.8.6 Rerun Fieldgen Option ...

When modifying precipitation and gage data, the user may wish to regenerate all of the MPE fields and ultimately produce a new best estimate precipitation field based on the modified data. An example of this would be if a radar site was "ignored" (through the Single Site Radar window) and two new gages are added using the "Add Psuedo Gage" option. To incorporate this new data into the "Field Bias Radar Mosaic", "Local Bias Radar Mosaic", "Gage Only Analysis", "Multisensor Mosaic", and "Best Estimate QPE", Fieldgen should be rerun. All of these fields will automatically be recomputed with the new data for the hour being processed.

A few modifications have been made to the original "MPE" way of rerunning the Fieldgen application. When the rerun fieldgen option is selected, the "Rerun FieldGen Dialog" pop-up window appears. Because rerunning FieldGen can be a time consuming enterprise, this dialog box provides the opportunity to abort the attempt to rerun by selecting "No". Note that if "Yes" is selected, the rerun may take up to several minutes, depending upon the size of the MPE area and the load on the system. This dialog also provides the option to rerun the MPE precipitation processor (siipp). By rerunning siipp, the precipitation estimates stored in the procprecip table within the IHFS database are updated based upon the very latest precipitation gage reports. These precipitation estimates are then fed into FieldGen which generates the new grids. While it is very desirable to have the regenerated grids reflect the most recent data, the tradeoff is that rerunning siipp can take several minutes and this coupled with the time needed to rerun fieldgen can amount to more time than the forecaster is willing or able

to spare.

Rerunning FieldGen without first rerunning siipp will normally be fine. Discrepancies may appear between the values of gages on the gage data overlay and the data in the MPE data field being displayed since the gage data in the gage overlay is updated more rapidly than when siipp is run to process it. So there could be a large reported gage value with no indication of such a value in the "Gage Only" and "Multisensor Mosaic" fields.

3.2.8.7 Draw Polygons Option ...

The draw polygons option allows the user to manually draw precipitation areas onto the main window by defining polygons and assigning a precipitation value to each or substituting a precipitation value from other MPE_fieldgen generated fields. The modified field should then be saved.

Precipitation areas may be drawn on the main window as follows:

1) Select the "Draw Polygons" option on the MPEcontrol menu. The program enters the "draw mode".

2) A polygon may now be drawn by using the mouse and left clicking wherever a polygon vertice is desired. To close the polygon, the right mouse button needs to be clicked once. The polygon may only contain up to 19 points. If drawing 19 points, the polygon will automatically close.

3) Once the polygon is closed, the "Edit Precipitation" GUI will appear.
This GUI contains options for modifying the data contained within the polygon. The top part of the GUI contains a slider bar with four buttons, "Set", "Raise", "Lower", and "Scale" located just below it . The slider bar acts in conjunction with each of these buttons as follows:

Set - This button sets all grid boxes contained within the polygon to the value specified by the slider bar.

Raise - This feature sets the minimum value a grid bin contained within the polygon may have. This threhold value is specified by the slider bar. All grid bins with values lower than this threshold are raised to it. All grid bins with values higher than this threshold are left unchanged.

Lower - This feature sets the maximum value a grid bin contained within the polygon may have. This threshold value is set by the slider bar. All grid bins with values higher than this threshold are lower to it. All grid bins with values equal to or lower than this threshold are left unchanged.

Scale - This feature takes the value of each grid bin contained within the polygon and multiplies it by the value specified on the slider bar.

In addition to this, values from the other precipitation fields may be substituted into the polygon. The bottom part of the Edit Precipitation GUI contains a list of radio buttons corresponding to the precipitation products which may be substituted into the polygon. These

are the Radar Mosaic, Field Bias Mosiac, Local Bias Mosaic, Multisensor Mosaic, Gage Only Analysis, Satellite Precipitation, and the Best Estimate QPE. The Substitute button positioned below these options will fill the polygon with data from the currently selected precipitation product.

4) Steps 2 and 3 may be repeated several times to draw multiple polygons.

Note that in OB3 there is no longer a limit on the number of polygons that may be drawn.

In OB3, the first polygon point must be placed within the bounds of the MPE forecast area. If it is not, then an error dialog will be displayed stating that the cursor is out of range. Subsequent points in the polygon may be drawn inside or outside of the forecast area. If a point is placed outside of the forecast area's bounds, then it will be "snapped" back so that it is positioned just inside of the boundary.

In order for the draw polygon changes to be made permanent, the data field must be saved.

3.2.8.8 Show Single Radar Site ...

The show single radar site option initially brings up the "Radar Sites" GUI. This GUI allows the selection of a specific radar site that provides coverage within the WFO or RFC area. By highlighting a site and selecting the "Ok" button, the "Single Radar Site" GUI is launched. This window has four panes or panels. Going clockwise starting in the upper left hand corner of the window the panes are "Raw Radar", "Radar Climatology", "Radar Coverage Map" , and "Mean Field Bias Corrected Radar".

The "Raw Radar" map is the unbiased radar based digital precipitation product. It is a 131 by 131 km grid centered on the specific radar site. The "Radar Climatology Grid" is the climatological radar precipitation value for each of the grid boxes. The "Radar Coverage Map" is a map of the radar beam blockages. It is displayed using black and red colors. The black grid boxes are the grid boxes in which there is no radar coverage available due to radar beam blockages. The red grid boxes do have radar coverage available. This information is read from a file in the "misbin" directory. If the file is not available, then the circle will be drawn all filled in. The "Mean Field Bias Corrected Radar" is the raw radar field data values multiplied by the mean field bias value (which is displayed at the bottom of the screen). If data is not available for the selected radar site, then the text "Missing Radar" is displayed within the "Raw Radar" and the "Mean Field Bias Corrected Radar" panes.

The menubar across the top of the "Single Radar Site" window contains the "Control", "Options", and "Overlays" submenus. The "Control" menu contains the "Close" button. This simply closes the single site window.

The "Options" menu contains the "Edit Bias Value", "Ignore Radar", "Display Adaptable Param", and "Display Supplemental Data" items. The "Edit Bias Value" option provides the means to alter the radar mean field bias value used to "correct" its precipitation estimates. It launches the "Edit Bias Value" popup slider bar window through which the mean field bias value can be easily changed. The "Ignore Radar" option provides the means of excluding a specific radar's data (if for example it is corrupt or bad) from the derived MPE precipitation. In this release, there is no way to turn a radar back on after it has been ignored. A future

enhancement will allow the radar to be reused. Note that for both the "Edit Bias Value" and the "Ignore Radar" options, the "Rerun FieldGen option must be selected so that all of the MPE fields can be recomputed without that radar's data.

The "Display Adaptable Param" option displays the radar-specific adaptable parameters which include preprocessing algorithm parameters, rate algorithm parameters, accumulation algorithm parameters, and adjustment algorithm parameters. The "Display Supplemental Data" option displays data derived from the radar field. This information includes the product generation time, the volume coverage pattern, the operational weather mode, the maximum data value, and whether or not precipitation was detected during the hour leading up to this product.

Finally, the "Overlays" submenu contains the following options: "RFC boundaries", "States", "County", "Cities/Towns", "Basin boundaries", "Rivers", "Precip Gages", and "Radar Umbrella". Each of these overlays provides a way of toggling on and off a specific overlay. The overlay selected is displayed or undisplayed in each of the four panes of the "Single Radar Site:" window.

The user may display more than one Single Site Radar Window at a time. One window may be opened for each of the radars providing coverage to the site's MPE forecast area.

3.2.8.9 The Gage Submenu

The gage submenu contains the "Add Pseudo Gage", "Show Gage Table ...", "Show Gage Identifiers", and "Show Gage Values" options. These functions operate as follows:

3.2.8.9.1 Add Pseudo Gage

This option allows the user to add a false (pseudo) gage report. When this option is selected, the mouse pointer temporarily turns into a leftward pointing hand to indicate that the application is in "pseudo gage mode". Left clicking on the portion of the Hydroview_MPE viewing area that the user would like to insert the new gage brings up the "Add Pseudo Gage" window. This subwindow consists of a slider bar to set the gage's value and option buttons which allow the user to set the value, to cancel the value selection, and to get more help about the add pseudo gage functionality. Once the slider bar is set to the desired value and the "Ok" button is selected, the new gage report is created in the database by inserting a new record into the PseudoGage table. In order to actually use the new gage data in the generated fields, the "Rerun FieldGen" option must be selected. After FieldGen has been rerun, the "Gage Only" and "Multisensor Mosaic" analyses will reflect the new gage. If displaying the gage identifiers, then once FieldGen is rerun, the pseudo gage will have a name like "pseudoN" where N is the number of pseudo gages created for the hour, starting with the number "00".

3.2.8.9.2 Show Gage Table ...

The gage table provides a tabular display of all of the gages contained within the WFO or RFC area's HRAP grid. These are the gages that contribute to the "Multisensor" and "Gage Only" fields and to the calculation of the mean field bias. This gage listing includes any pseudo gages created by the user. The GUI consists of a simple menu bar with the submenu headings "Control", "Sort Gages", and "Help". "Control" provides the option to quit the gage

table. “Sort Gages” provides the ability to sort gages by gage value, by gage identifier, and by radar identifier. “Help” provides access to the help gui. The three columns in the table have the headings “Gage Id”, “Gage”, and “Edit”. Each row in the table corresponds to a specific gage location. The identifier of the gage is listed under “GageID”, the value of the gage is listed under “Gage”, and a new value for the gage may be entered in the “Edit” column. A missing value must be denoted as either “M” or “m”. Note that when “quit” is selected from the “Control” menu, the application automatically searches the edit column for changes. FieldGen must be rerun in order to make the modifications visible.

The main body of this GUI consists of a large table which contains a row for each of the gages contained within the WFO or RFC area’s HRAP grid. There are ten columns. These are “GageID”, “Gage”, “QPE”, “Mmosaic”, “RadarID”, “Rmosaic”, “Bmosaic”, “Lmosaic”, “GageOnly”, and “Edit”. The “Gage Id” column displays the identifier of the gage. The “Gage” column displays the value of the gage. The “QPE” column displays the best estimate QPE for the HRAP bin that the gage occupies. The “MMosaic” column displays the multi-sensor precipitation estimate for the gage’s HRAP bin. The “RadarID” column indicates which radar umbrella the gage is covered by. The “RMosaic” column shows the radar estimated rainfall for the HRAP bin the gage is located in. The “Bmosaic” and “LMosaic” columns display the field bias radar mosaic and local bias radar mosaic values, respectively, for the HRAP bin the gage is located in. The “GageOnly” column displays the value from the Gage Only Analysis field corresponding to the gage’s location.

3.2.8.9.3 Show Gage Identifiers

The show gage identifiers option toggles on and off the display of the gage ids on the Hydroview_MPE display.

3.2.8.9.4 Show Gage Values

The **Show Gage Values** option toggles on and off the display of the gage values on the Hydroview_MPE display. A missing gage value is signified by the value “-999.”.

3.2.8.10 Time Lapse Submenu

The time lapse submenu contains the following options: “6hr”, “12hr”, “24hr”, “other ...”, and “End Loop”. The first four options specify the duration of the time lapse. All time lapse durations end with the current hour of data being examined. So, if the 6 hour time lapse is chosen, then Hydroview_MPE data for the last five hours plus the current hour are displayed in the time lapse. By default, when time lapse is started, it begins with the oldest data field and loops to the most recent data field. It then resets back to the oldest data field and loops again to the most recent data field. This process continues until the user ends the time lapse by selecting the “End Loop” menu item, selects manual loop frame stepping, or performs a zoom, pan or recenter action.

When the “End Loop” option is selected, the image displayed in Hydroview/MPE is the one being viewed before the time lapse was started.

To select manual loop frame stepping, the left or right key on the keyboard needs to be selected. The left arrow is for reverse looping while the right arrow key is for normal looping. Pressing the left arrow key will set the display to the current hour's data field. Subsequent left arrow key presses will loop backward in time from there. Pressing the right arrow keyboard button will set the display to the oldest hour's worth of data within the selected time lapse range. Subsequent right arrow key presses will loop forward in time from there. To resume automatic time lapsing the up or down keyboard key needs to be pressed.

In addition to the "End Loop" menu option, the time lapse may be stopped by performing a zooming, panning or recentering action on the time lapsing image. For instance, if an interesting precipitation feature is observed in a particular frame during time lapsing, by placing the mouse cursor over the image and clicking the middle mouse button, the time lapse will stop on that frame and recenter and zoom into that feature. If a left mouse click was performed instead, then the time lapse would stop on the frame and recenter on the click point and zoom out.

The time lag between the successive image displays in the time lapse is specified by the token "hydroview_mpe_timelapse". It is a value in milliseconds. If the token is not set, then the default duration is 1 second (1000 milliseconds).

A time lapse with a duration other than those explicitly shown on the time lapse submenu can be set by selecting the "Other ..." option. This launches a gui with a slider bar that allows the duration of the time lapse to be set to any value from 1 hour to 24 hours.

3.2.9 MPEfield Menu Options.

As shown in Figure 3-13, these menu options allow the display of the different Hydroview_MPE data and reference fields. The first six field options listed on the menu are observed rainfall estimates based either purely on radar as with the "Radar Mosaic Field", purely on gage data as with the "Gage Only Analysis Field", on a combination of radar and gage estimates as with the "Multisensor Mosaic Field", on biased radar rainfall amounts as with the "Field Bias Radar Mosaic" and the "Local Bias Radar Mosaic", or "best guess" field, the "Best Estimate QPE". The "Local Span", "Local Bias", "Height Field", "Radar Coverage Field", and "Prism" are reference fields which will be described in more detail below. The "Display Bias Table" option provides the ability to display the individual mean field biases for each of the radars providing at least some coverage for the WFO or RFC area. The "Display 7 x 7" option allows the display of a gage point and the 7 x 7 matrix of HRAP grids centered on it.

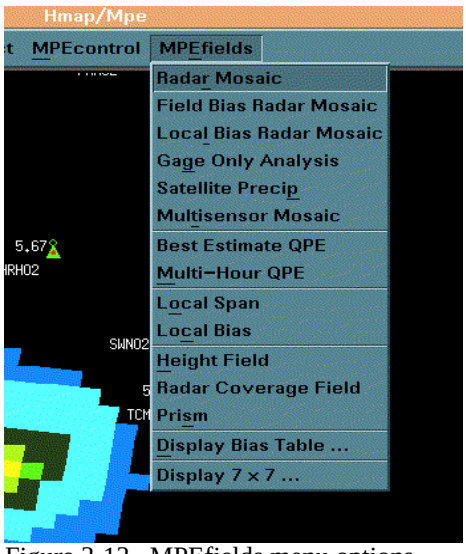

Figure 3-13. MPEfields menu options

3.2.9.1 Radar Mosaic Option

This field represents the rainfall estimate as derived directly from the mosaic of DPA grids for each of the individual radar sites that provide coverage for the WFO or RFC area. It is the raw radar precipitation estimate.

Selecting this option will cause the radar mosaic to be displayed on the Hydroview_MPE viewing area. It should be noted that for each HRAP grid bin in the raw radar mosaic, the radar which provides coverage at the lowest height above sea level is selected to fill that bin. The "Height" and "Radar Coverage" fields described below are used in determining this optimal radar value for each of the grid bins.

3.2.9.2 Field Bias Radar Mosaic Option

This option displays the raw radar mosaic with the mean field bias applied to it. Each radar site has its own mean field bias value for "correcting" the precipitation. These mean field bias values are viewable in the "Display Bias Table" menu option, discussed more in depth below. The application of the mean field bias value is an attempt to make the radar-estimated precipitation amounts more accurate and reliable. In effect, the mean field bias value is applied to unbias the radar estimated precipitation amounts.

The bias values are arrived at by comparing ground truth precipitation observations (from gages) with the raw radar-estimated rainfall amounts over ten different spans of time (also known as memory spans) ranging from under an hour, daily, weekly, monthly, seasonal, to period of record.

3.2.9.3 Local Bias Radar Mosaic Option

The local bias mosaic is created by computing the bias for each grid box of the HRAP grid that represents a WFO or RFC area. The resulting grid of local bias values is then applied to the raw radar mosaic to produce the local bias radar mosaic. By computing the bias for each HRAP grid bin, it is hoped that local geographical effects on rainfall can be captured. The actual bias value for each grid bin can be viewed with the "Local Bias" field.

3.2.9.4 Gage Only Analysis Option

The gage only analysis represents the precipitation as estimated by gages only. In order to compensate for the generally large spacing between gages, an attempt is made to spatially smooth the precipitation around a gage point.

3.2.9.5 Satellite Precip Option (Unavailable in AWIPS Release 522)

In AWIPS release OB1, the satellite precip option allows satellite estimated precipitation amounts to be viewed in the Hydroview/MPE display. Satellite precipitation estimates (SPE) are not included in the multisensor mosaic.

Planned enhancements to the SPE product include the application of a local bias and the inclusion of these precipitation estimates into the multisensor mosaic. The local bias will behave much like it currently does for the radar-based precipitation estimates. It will provide the ability to unbias the satellite estimated precipitation amounts on a HRAP grid bin basis. This will provide the ability to isolate portions of the forecast area where satellite-based rainfall estimates are chronically too high or too low.

Note that the SPE product may be time lapsed just like any of the other products. Also, it

may be saved as the best estimate QPE just like any of the other products.

3.2.9.6 Multisensor Mosaic Option

The power of precipitation estimation in Hydroview_MPE is the fact that precipitation estimates from radar and gages may be combined to produce a mean field bias to create a multimosaic field that provides a best precipitation estimate. This is normally the basis for the "Best Estimate QPE" field.

3.2.9.7 Best Estimate QPE Option

The Best Estimate QPE defaults to the multisensor mosaic when FieldGen is initially run to create the MPE data fields (however a new token named "mpe_qpe_fieldtype" has been added to the latest version of FieldGen which allows other fields to be used as the Best Estimate QPE). Using options such as substituting precipitation areas (through the "Draw Polygons" menu item on the MPEcontrol menu) and adding gages (through the "Add Pseudo Gage Option on the MPEcontrol Gage submenu) the Best Estimate QPE field may be easily modified.

3.2.9.8 Multi-Hour QPE

This provides the ability to display multihour precipitation estimates. At this time, these rainfall totals are derived by summing together the hourly best estimate QPE products. The user is given full control over when and how long to tally these rainfall estimates through a simple GUI.

This feature is accessed by selecting the "Multi-Hour QPE" item on the "MPEfields" menu. This displays the "Multi-Hour Precipitation Accumulation" GUI. This interface is divided into two distinct frames, namely the Accumulation Interval Setup frame and the Accumulation Display Control frame. The Accumulation Interval Setup frame has a drop down menu labeled "Duration:" which allows the user to select the interval over which to sum the rainfall amounts. If the desired duration is not on the option menu, then the user may select Other (at the bottom of the option menu). This will create the "Accumulation Interval" slider bar which allows which allows any interval from 1 to 72 hours to be chosen.

Just below the duration option menu is the ending time text field. This text field specifies the end time of the interval that multi-hour rainfall totals are being computed over. By default this text field displays the time of the MPE data field currently being viewed in the main window. However, it may be easily modified through the use of the incrementing and decrementing arrow buttons at either end of the end-time text field. The arrow buttons to the left of the text field, labelled "Day Adjust" allow the day portion of the date to be modified. The arrows buttons to the right of the text field, labelled "Hour Adjust", allow the hour portion of the date to be modified. The user cannot enter a date directly in the text field.

The "Accumulation Display Control" provides the "Display As" option menu which allows multi-hour precipitation totals to be displayed as either HRAP grid values, basin averages, county averages, or zone averages. The "Show Data" button triggers the display of the multi-hour precipitation estimate based on the user-selected duration, ending time, and display resolution (HRAP grid, basins, counties, or zones). The identifiers and values of the

precipitation areas may be shown using the “Values” and “Ids” annotation toggle buttons.

Below the Accumulation Display Control frame are the are the “Close” and “Help” buttons which, respectively, destroy the GUI and allow for the retrieval of topic-specific help.

When the multi-hour precipitation option is being used, the user may not access any of the items on the MPEcontrol menu. This means that a multi-hour precipitation field cannot be saved as the best estimate QPE, time lapsed, have polygons drawn on it, or have pseudo gages plotted on it. Also, since this product spans a multi-hour interval, the concept of choosing the next or previous hour’s worth of data does not apply. The reason for this is that the Multi-hour precipitation estimate is not one of the base xmrg fields that is saved on disk for future reference. It is simply a displayed product that can be used for current reference. In order to regain access to the MPEcontrol menu items, one of the fields other than the multi-hour precipitation estimate must be selected from the MPEfields menu. In this release of the Hydroview_MPE application, missing values encountered during the accumulation of hourly precipitation totals are not reported to the user. Missing values may be present on a grid bin by grid bin basis or as entire missing fields. Keeping this in mind, it is important to remember that because of missing data, a displayed multi-hour precipitation estimate for a given number of hours may not have been able to find data for all of the hours.

When viewing basin-averaged multi-hour rainfall estimates, each basin must be covered by a minimum percentage of valid, non-missing values in order to be assigned an average rainfall estimate. If this minimum percentage is not met, then the basin is assigned a value of missing and colored as light gray.

3.2.9.9 Local Span Option

The local span field reflects the memory span that is used for computing the local bias of each of the HRAP grid bins. Just as the local bias can be different for each of the grid bins, so is the memory span value different for each of the grid bins. The “Local Span” and “Local Bias” fields are used together to compute the “Local Bias” precipitation mosaic.

3.2.9.10 Local Bias Option

The “Local Bias” field reflects the local bias value for each of the grid bins in the HRAP grid. The span of time (the memory span) over which the local bias was calculated is represented by the corresponding HRAP grid bin in the “Local Span” field described above.

3.2.9.11 Height Field Option

The height field displays the lowest available radar height that provides coverage for a particular HRAP grid bin. If a low elevation radar beam is blocked relatively close to the radar emitter, then the next higher elevation radar beam is selected in hope that it will be high enough to “see” over the obstacle. If, because of missing radars or ground obstacles, the grid bin has no coverage from any radar, then it is assigned a missing value.

3.2.9.12 Radar Coverage Field

Based on the “Height Field”, the radar coverage field displays which radar site is providing

coverage for each HRAP grid bin. The "Height Field" is used in determining which radar location provides the lowest coverage for each of the bins. If no radar is providing coverage for a grid bin, then the grid bin receives a missing value. Ultimately, this field is used in determining the radar biases that are applied to each of the grid bins when computing products such as the "Field Bias" mosaic.

3.2.9.13 PRISM

PRISM (Parameter-elevation Regressions on Independent Slopes Model) data is long term climatological precipitation data. The multisensor precipitation estimates are scaled by the PRISM climatologies to improve estimates especially in mountainous regions which are subject to large orographic influences.

3.2.9.14 Display Bias Table

The "Display Bias Table" option launches the "Edit Bias Table" GUI. From here, the user may easily view the radar-specific biases for the radar sites which provide coverage for the WFO or RFC area. The three buttons across the top of this GUI, "Close", "Apply", and "Help" provide the means for closing the application, applying bias changes, and getting more information respectively. There are five columns of data in this table. Each row in this table provides bias information specific to a particular radar site. This information includes the radar's identifier, its mean field bias value, whether the mean field bias has been manually updated, and the A and B coefficients used in the Z-R relationship by the Radar Product Generator when producing the DPA product. Note that by selecting any one of the radars listed in the bias table window, a window displaying the memory span information used at computing that radar's mean field bias is shown.

3.2.9.15 Display 7 x 7

The "Display 7 x 7" option provides the ability to view a 7 x 7 grid of HRAP bins centered on a precipitation gage. This feature, which is a carry over from the original MPE application, is intended to give the forecaster the capability of analyzing the precipitation distribution at a very detailed scale of resolution around a gage site. It also provides the ability to modify the gage's value. For example, the user may wish to lower or raise the gage's precipitation amount to make it more consistent with the estimated precipitation amounts in the HRAP bins surrounding it.

When the "Display 7 x 7" option is chosen from the MPEfields menu, the mouse pointer changes to a leftward pointing hand. A gage is selected by positioning the hand over it and executing a single click of the left mouse button. If a gage is not directly under the clicked point on the map, then the gage that is closest to the click point is selected as the center of the 7 x 7 display. After clicking on or near a precipitation gage the 7 x 7 GUI window appears. This simple GUI contains the identifier of the gage the grid is centered on, the value of the gage, and a 7 column by 7 row table where each element represents the estimated precipitation value of one of the HRAP bins in the vicinity of the gage.

The values displayed in the grid reflect the type of field that the user is viewing in the main window. For example, if the best estimate qpe field is being viewed in the main window, then the values inserted into the 7 x 7 grid will also be best estimate qpe. The colors assigned to the values in the 7 x 7 hrap grid follow the legend displayed with the MPE product being viewed in the main window.

In OB3, the 7 x 7 GUI does not have to be closed between successive gage edits. The 7 x 7 GUI display automatically updates each time a new gage is selected in the Hydroview_MPE display.

The 7 x 7 GUI has four buttons arranged down its left side. The Apply button applies the value specified by the Edit Gage Value slider bar to the gage being edited. The Undo button returns the gage to the value it had before the most recent edit. The Set Missing button sets the gage's value to missing. The Close button closes the 7 x 7 GUI and exits Hydroview_MPE from 7 x7 mode.

3.2.9.16 Set Colors

A new feature in OB3 is the Set Colors option on the MPEfields menu. Selecting this menu item launches the Color Thresholds GUI. This GUI allows the precipitation ranges and the colors associated with them to be defined for each of the MPE fields and mosaics. These colors are set on a user by user basis allowing color schemes to be tailored to an individual's preferences and needs. This color information is stored in the ColorValues table in the IHFS database. If a user does not have color information setup, then the default color scheme is used.

The large scrolled list which occupies the top half of the Color Thresholds GUI presents the thresholds and the color data associated with them for the currently selected product. This list box displays the name of the product, the duration of the product, the numeric threhold, and the color associated with that threshold.

The bottom half of the Color Thresholds GUI contains the options which control which product is displayed in the selection list and allow the setting of individual thresholds and the colors associated with them. The ColorUse option menu allows the following MPE products to be selected: Radar Mosaic, Field Bias Radar Mosaic, Local Bias Radar Mosaic, Gage Only Analysis, Satellite Precip, Multisensor Mosaic, Best Estimate QPE, Multi-Hour QPE, Local Span, Local Bias, Height, Radar Coverage, and PRISM.

The duration specifies the number of hours the product spans. For most of the MPE products this will be 1 hour. However, the multi-hour precipitation product can span several hours.

The threshold may be Missing, < Min Threshold, >=Value. Note that each product must have a Missing and a < Min Threshold Value defined for it.

The Value text box specifies the value associated with the threshold. A value does not apply to the Missing and < Min Threshold categories - they are assigned internally by the Hydroview_MPE application.

Below these options is the Color Name scrolled list. This list contains the names of all the colors which may be used in defining the thresholds. These are read in from the ColorNames table in the IHFS database.

The four buttons at the bottom of the Color Thresholds GUI behave as follows:

Apply - Updates the color scheme for the selected product. This includes adding a new color threshold and associated color or modifying an existing color threhold.

Delete - Removes the color threshold selected in the list of color thresholds. The Missing and < Min Threshold definitions may not be removed.

Default - Resets the color scheme for the selected product back to the default. The default color scheme is arrived at by first checking the ColorValues table for user "default" and then determining if the currently selected product has defined color threholds. If there is no user "default", then hard coded colors are used.

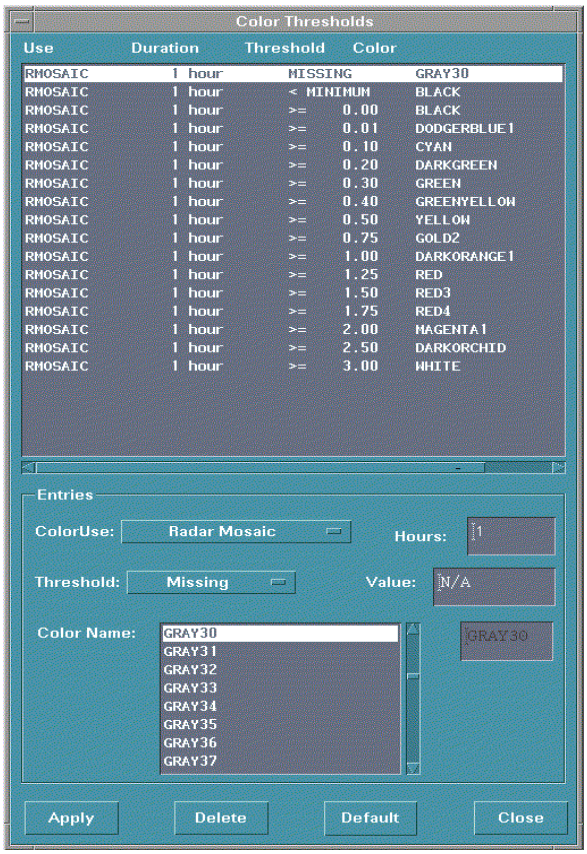

Figure 3-14. The Color Thresholds GUI.

Close - Closes the Color Thresholds GUI.

3.2.10 Help Menu Options

The Help menu displays three menu items: "Help Topics", "About", and "Map Legend". The "Help Topics" item launches the Hydroview_MPE help window which provides detailed instruction on the use of the features of the application. It also allows the user to search for keywords in the help topics. The "About" item provides the version and release of the Hydroview_MPE application.

In OB3, the "Map Legend" toggle button turns "on" and "off" the MPE data map legend and the Station Legend GUI. When MPE data is not being viewed, then only the Station Legend will be displayed. When MPE data is being displayed, then both legends are displayed.

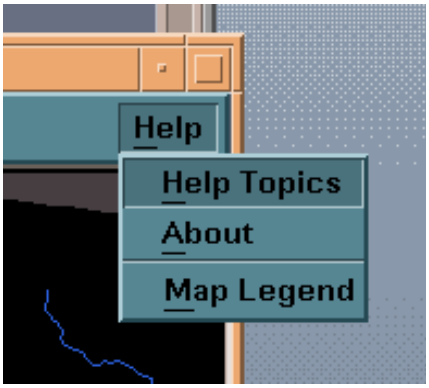

Figure 3-15. A "snap shot" of the Help menu on Hydroview_MPE.

The Station Legend explains the symbols used by the point display control when plotting station data. It can be closed by selecting the close button at the bottom of the Station Legend GUI.

4.0 Mouse Controls and Hot Keys

Hydroview_MPE provides flexible mouse controls and a number of hot keys which are intended to speed up the use of the application. Table 4-1 shows the behaviors associated with a standard three-button mouse.

Table 4-1. Hydroview_MPE Mouse Functionality

Mouse Button	Functionality that Results
Single Left Button Click	Zoom out and recenter at the click point.
Single Middle Button Click	Zoom in and recenter at the click point
Single Right Button Click	Displays a "pop up" menu near the click point with additional options (see below)
Double Left Button Click	Select a station. A red box will highlight the station that is selected. If a selected station is double clicked on, then it is deselected.
Double Middle Button Click	Select a station and launch the Time Series Control window for it. A red box will highlight the station if it is not already highlighted.
Left Mouse Button Press and Drag	Draw a zoom rectangle. The rectangle is completed when the left mouse button is released.
Right Mouse Button Press	Displays a "pop up" menu with additional options (see below). A release of the right mouse button pops down the menu.

4.1 Exceptions to Mouse Functionality

There are several cases in Hydroview_MPE when the default mouse behavior is temporarily overridden.

When adding a pseudo gage (reached from the **Add Pseudo Gage** item under the **Gages** submenu on the **MPEcontrol** menu), a left mouse click will select the location on the map to place the pseudo gage. To indicate that the mouse is in "add pseudo gage mode", the mouse pointer changes from an arrow to a hand until the location of the new gage is selected.

When drawing a new polygon (reached from the **Draw Polygons** item under the **MPEcontrol**), a left mouse click draws the vertices of the polygon. A middle or right mouse button click closes the polygon

Zoom mode is disabled when the user chooses the **MPEcontrol->Draw Polygons** or **MPE Control->Gage->AddPseudoGage** menu item. **Gage->ShowGageIdentifiers/Values** menu options are available in regular or zoom mode.

When the display 7x7 option is selected from the MPEfields menu, a click of the left mouse button will select the gage closest to the click point on the Hydroview_MPE display and launch the Display 7 X 7 Gage Editing Utility GUI.

4.2 Pop Up Menu Options

A single click of the right mouse button or holding down the right mouse button while the mouse cursor is over the main viewing area will cause a "pop up" menu to be displayed at the click point. This popup menu contains the options shown in Table 3-1.

Table 4-2. Pop Up Menu Options
In - Zoom the map in.
Out - Zoom the map out.
Recenter - Recenter the map on the point where the user clicks next.
Up - Pan the map up.
Down - Pan the map down.
Left - Pan the map left.
Right - Pan the map right.
Lat/Lon - Turn on or off the latitude / longitude information that chases the cursor.
MPE Info - Turn on or off the MPE legend
Timeseries - Highlight the station that was clicked on (if it wasn't already highlighted) and launch the time series control for it.

4.3 Hot Keys

Hydroview_MPE offers several hot keys for accessing some of the more heavily used features. These are shown in Table 4-2.

Table 4-2 Hydroview_MPE Hot Keys

Hot Key	**Action**
Alt + C	Close the Hydroview_MPE application
Alt + R	Show a single radar site
Alt + S	Save the Hydroview_MPE screen as a GIF
Alt + U	Draw the radar rings
Ctrl + B	Display the basins overlay
Ctrl + N	Show the next hour's data field

Ctrl + P	Show the previous hour's data field
Ctrl + S	Save the displayed MPE field as the best estimate field.
Ctrl + T	Toggle the toolbar on and off
Ctrl + Z	Zoom in or out of a zoom rectangle. This hot key can also be used to undo the previous zoom, pan, or recenter operation.